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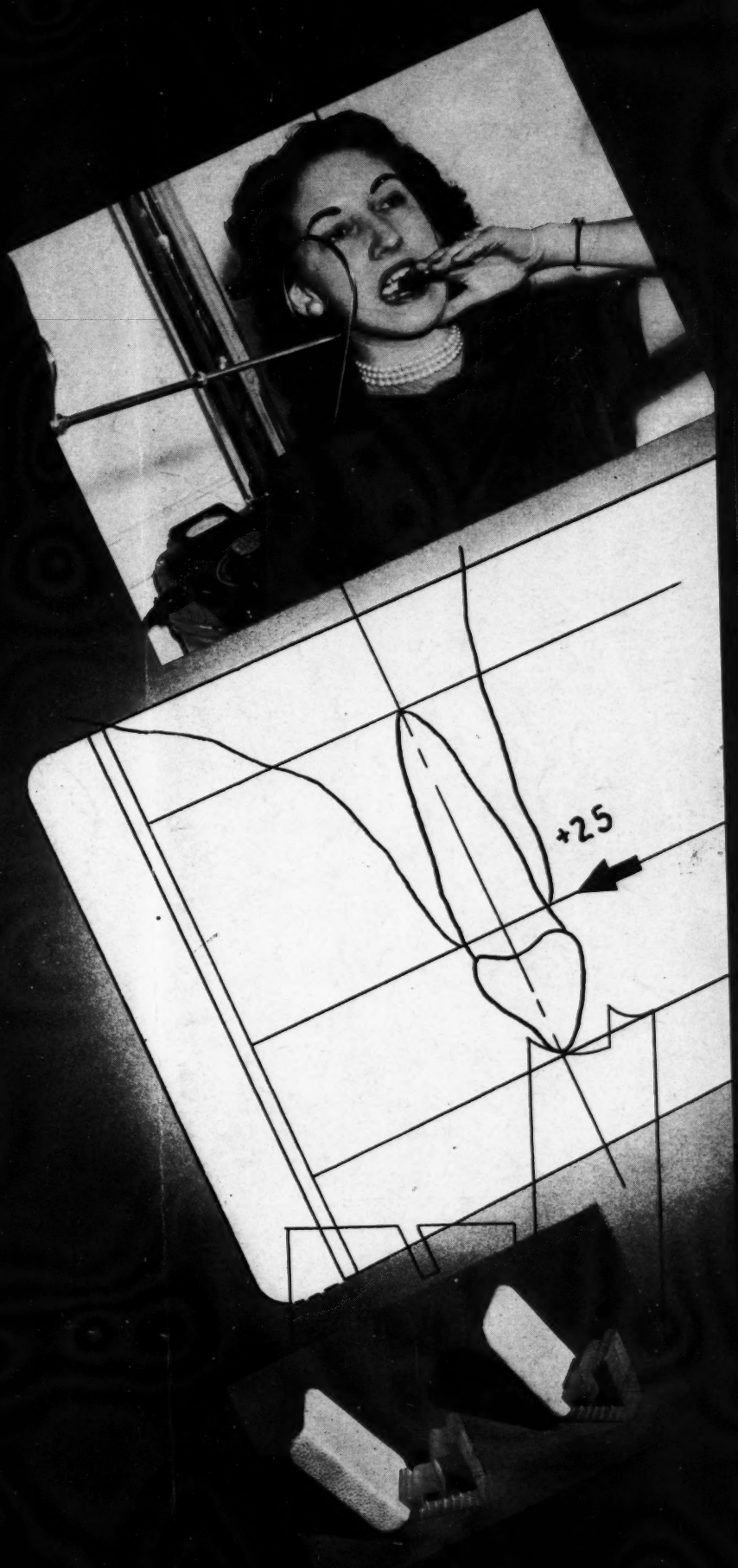

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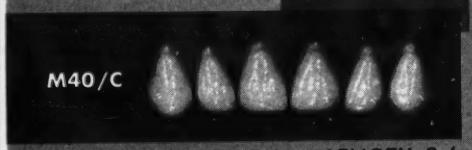
NOTE: *MEASUREMENTS FOR CENTRALS ARE GIVEN IN MILLIMETERS • LENGTHS NOTED ARE EXCLUSIVE OF COLLARS*

these 12 new upper molds have been added to the FIVE-PHASE co-ordinate size system...



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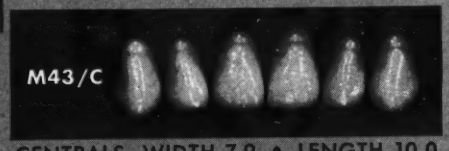

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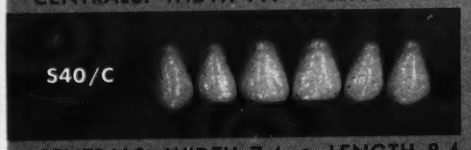

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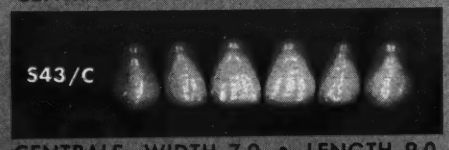

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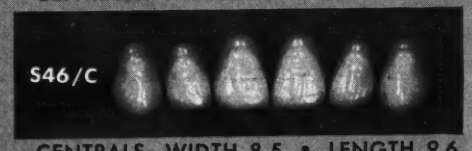

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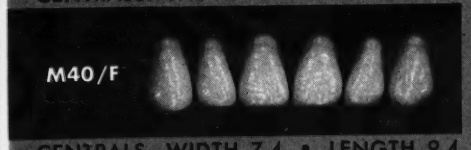

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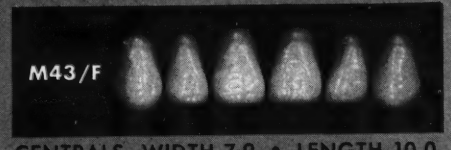

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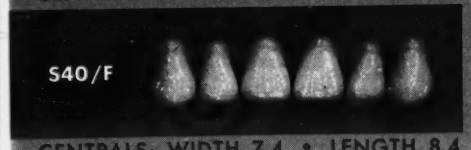

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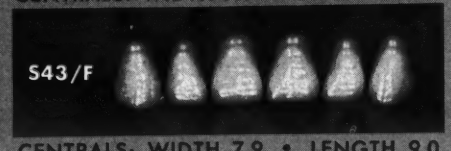

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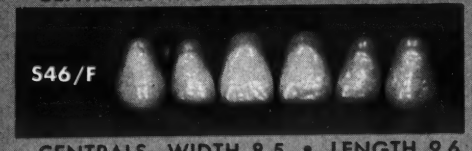

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About Our CONTRIBUTORS

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JOSEPH E. SCHAEFER, M.D., D.D.S., well known as an oral surgeon, has contributed numerous articles to DENTAL DIGEST on unusual problems in dental surgery. Collaborating with RALPH C. RUDDER, M.D., D.D.S., Doctor Schaefer presents in the current issue ACCIDENT IN AN ATTEMPTED EXTRACTION OF AN UPPER THIRD MOLAR, the case history of a tooth that disappeared during extraction procedure.

HARRY L. PAGE, who is the author of a book, MUCOSTATICS—A PRINCIPLE NOT A TECHNIQUE, attended Hotchkiss and Yale. Mr. Page specializes in prosthodontics and articulation. For his first publication in DENTAL DIGEST he presents CENTRIC AND THE HINGE-AXIS, an analysis of one of the most important problems in dentistry, articulation.

THOMAS H. FORDE, D.D.S. (University of California, 1924) presents the third installment of his four-part article, ORAL DYNAMICS, which combines in its approach the concepts of engineering and biology. Doctor Edward Koltisko of Washington, D.C. has illustrated Doctor Forde's article.

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WANDA T. PICKARD. B.A., Assistant Editor
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Intraoral ROENTGENOLOGY

DONALD W. McCORMACK, B.S., D.D.S., Altadena, California

DIGEST

This article presents a technical procedure for dental roentgenology that will produce a high degree of anatomic accuracy. Specific landmarks for angulation that can be applied to almost every mouth are described. The technique uses a minimum of twenty films.

A chart illustrating the correct positioning of film in all regions of the mouth is included.

Purpose of Bitewing Films

Bitewing films were developed by Raper[1] to produce more accurate images of the coronal portion of the teeth.

Interpretation of Coronal Conditions—One bitewing film was often sufficient for the posterior teeth on one side of the jaw. However, because of the various inclinations of the interproximal spaces, two bitewing films were usually necessary on each side to obtain all of the contact points.

Dentists have accepted the posterior bitewing films as being the most accurate for the interpretation of coronal conditions.

Bitewing Films of the Anterior Teeth—Because of the difference in the vertical inclination of the upper and lower anterior teeth, images of the anterior teeth are distorted.

Supplemental Bitewing Procedures—A device described by Lovett[2] allows the upper and lower anterior crowns to be x-rayed separately, on the same film, eliminating the distortion. These supplemental bitewing procedures have been developed to offset the distortion produced in the apical films.

The Right-Angle Principle of Angulation

In the February, 1950 issue of the *Journal of the American Dental Association,* the author[3] described a film holder and a target-distance localizer which can produce anatomically accurate intraoral roentgenograms when used with the present technique. The basis of this technique is the right-angle principle of angulation which was first described by Price[4] in 1904 but discarded because of inherent difficulties.

Franklin W. McCormack,[5] however, has used the principle constantly since starting in dental x-ray op-

Author's note: Equipment and supplies for the increased target-distance technique described are handled by the Ideal X-ray Supply Company, Pasadena, California.

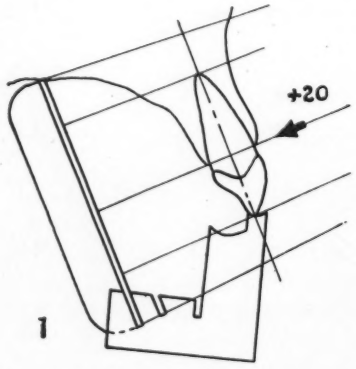
[1]Raper, H. A.: A New Kind of X-ray Examination, Internat. J. Ortho. **11**:76-86 (Jan.) 1925.

[2]Lovett, D. W.: Roentgenographic Technic for Anterior Interproximal Regions, J.A.D.A. **39**:392 (Oct.) 1949.

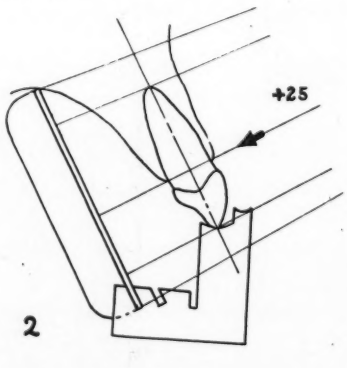
[3]McCormack, D. W.: Mechanical Aids for Obtaining Accuracy in Dental Roentgenology, J.A.D.A. **40**:144 (Feb.) 1950.

[4]Price, W. A.: The Technique Necessary for Making Good Dental Skiagraphs, D. Items Interest **26**:161 (March) 1904.

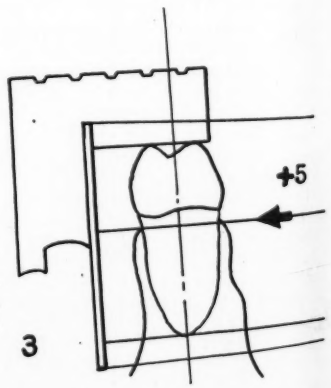
[5]McCormack, F. W.: A Plea for Standardized Technic for Oral Radiography, J. D. Research **2**:557-566 (Sept.) 1920.



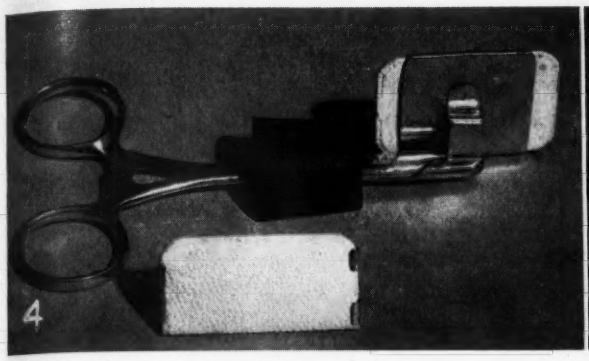
1. ***Plastic bite-block in Maxillary Region. Central incisor closes on top step; with central rays perpendicular to film surface, it automatically allows only 3/8 inch of film to extend below the incisal edge.***

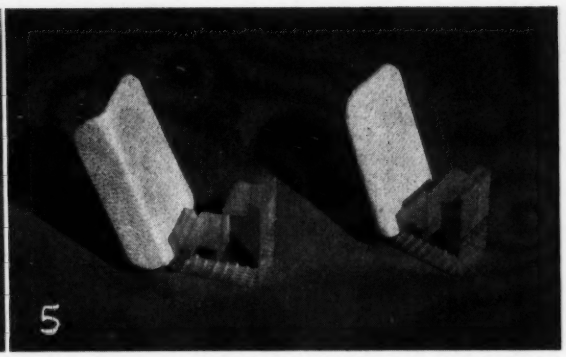


2. ***Plastic bite-block in Maxillary Region II. Cuspid closes on second step; with central rays perpendicular to film surface, it automatically allows only 1/4 of an inch of film to extend below the tip of the cuspid.***



3. ***Plastic bite-block in Mandibular Region IV. It allows the film to extend 1/8 inch above the occlusal surface and keeps it perpendicular to the occlusal surface.***





4. ***Hemostat, rubber bite-block, and film holders. Shows the hemostat placed through the hole in the rubber bite-block and clamped on the loop on back of the*** horizontal ***film holder, with film in position. Also a front view of the*** vertical ***film holder with the film folded to make it narrow, and the small flanges that hold the film.***

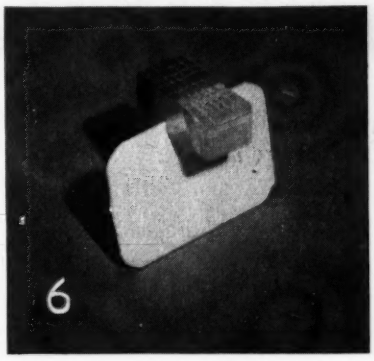
5. ***Plastic bite-blocks with films positioned for the upper anterior regions; one with the film folded to make it narrow and one for the narrow Eastman film, DF-55. Each block has slots for either film.***

erations and procedures in 1913.

Fitzgerald[6] and the author,[7] both trained by the author's father, Franklin W. McCormack, have been applying the right-angle principle for many years. Several dental schools have accepted the theory and it is being taught to students.

Procedure

Positioning the Films—To make accurate roentgenograms of the teeth it is necessary to have definite landmarks for positioning the films and alining the central rays from the x-ray tube. The ideal method would be to x-ray each tooth individually. This is impracticable. The mouth is therefore divided into sixteen areas: four in each quadrant, and four bitewing areas, two on each side, a total of twenty films.



6. ***Plastic bite-block with film positioned in conventional manner for the lower molar region.***

Size of Film—For the posterior regions the average film on the market is satisfactory in size, but for the anterior regions it is too wide. Folding the film lengthwise, or using Eastman DF-55 narrow film, is more accurate.

Definite Landmarks a Necessity—The landmarks for most right-angle techniques in use today depend upon the judging of the long axes of the teeth by the operator, as described by Appleman.[8]

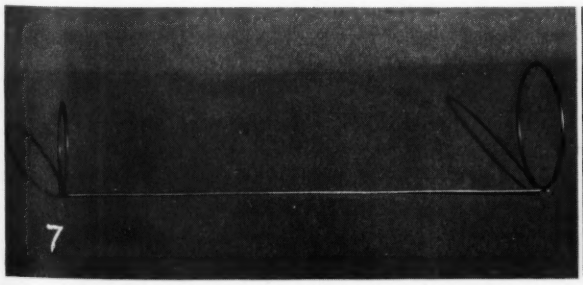
Many years of personal experience, operating (1) with and without the aid of angulation meters, (2) with the patient in both sitting and supine positions, and (3) at target distances of from 8 to 36 inches, have shown the necessity for having more definite landmarks for all areas of the mouth.

It is not possible to determine ex-

[6]Fitzgerald, G. M.: Dental Roentgenology 11: Vertical Angulation, Film Placement and Increased Object-Film Distance, J.A.D.A. **34**:1-20 (Feb. 1) 1947.

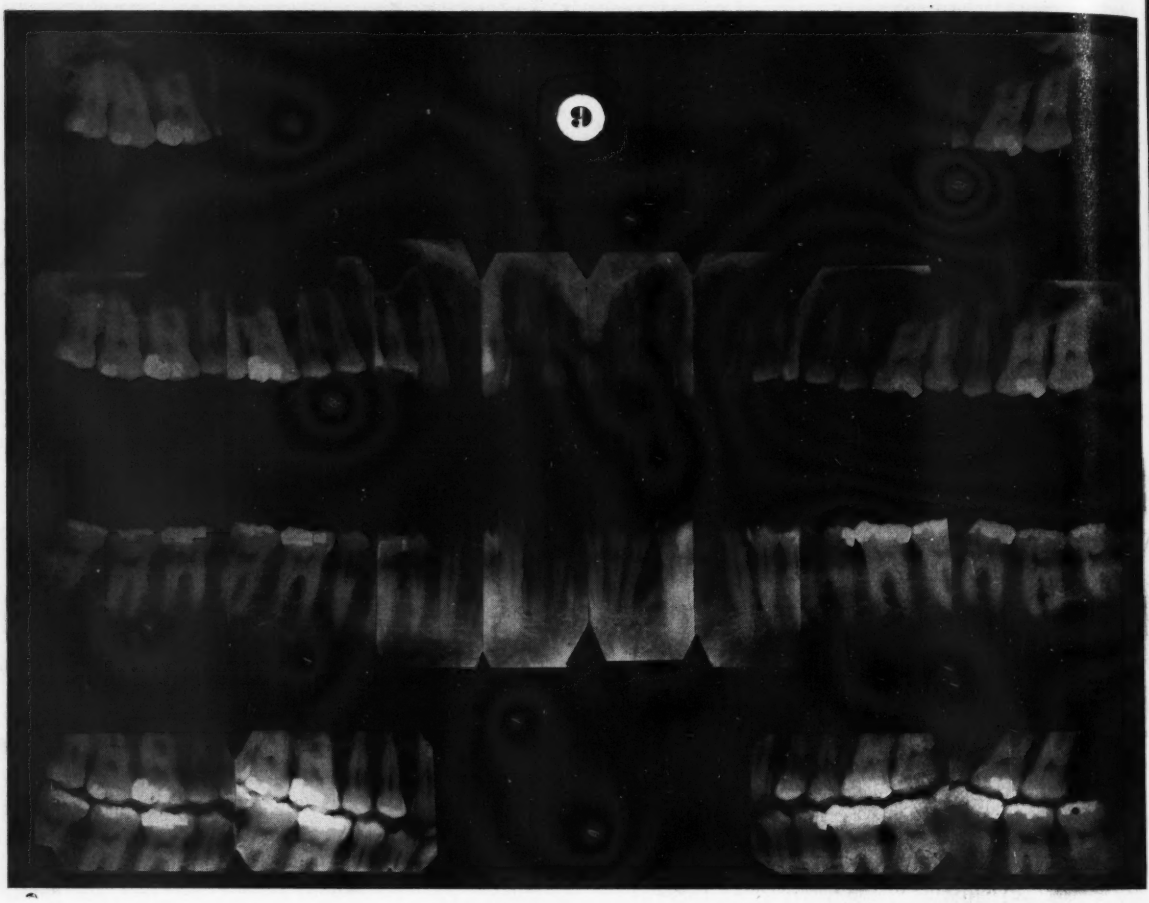
[7]McCormack, D. W.: Dental Roentgenology: A Technical Procedure for Furthering the Advancement Toward Anatomical Accuracy, J. California State D. Assoc. **13**:89-116 (May-June) 1937.

[8]Appleman, R. M.: The Extended Tube Technic in Intra-Oral Roentgenology, Am. J. Roentgenol. **42**:881 (Dec.) 1949.



7. ***Fixed localizer. The small ring attaches to the base of the cone of the x-ray apparatus and the large ring is positioned against the patient's face.***

8. ***Extension localizer with adaptor for x-ray apparatus. Square rod and tubing keep ring centered and allow the target distance to be varied. Area of radiation confined by the hole in the center of the adaptor.***



9. ***Complete set of intraoral roentgenograms. Maxillary and mandibular Regions I to IV, left and right sides, are mounted in the upper and lower center rows, respectively. The bitewing films are in the bottom row. Extra maxillary films would be mounted in the top row; two in this case. The Maxillary Region III films, each side, were taken with the film in a horizontal position as shown on the chart but the distal portion of each film was cut off to facilitate mounting the films within the limited area of the mount. The Rinn EZ-24-A cardboard mounts will accommodate these films. The Davis-Greene Corporation manufactures an 8x10 inch sheet plastic mount, that has a black background and it does not cover any of the films. It also accommodates 24 films.***

actly the long axis of a tooth by looking at it clinically. Visible landmarks, permitting the film to be placed approximately parallel to the long axis, but which can be definitely reproduced over periods of time, are more satisfactory.

Additional Test Required—In the anterior regions (1) judging the long axes of the teeth, or (2) using predetermined vertical angles of projection is not sufficient. An additional test, indicating whether or not the angle being tried is satisfactory and allowing for repetition, is necessary.

Method: This test is made by sighting along the central ray, through the localizing ring, to see how much film extends beyond the crowns of the teeth. Complete interpretation of roentgenographic results requires that the film include the entire tooth and the surrounding bone structure, especially apically.

Basis of the Test: A knowledge of the average tooth length in comparison to the length of the film used will let the operator know if the film is extending beyond the apexes of the teeth. This is the basis of the test described for checking vertical angulation.

Example: 1. The average length of an upper central incisor is about 1 inch and the length of the film used (folded type) is 1 and 6/8 inches.

2. If 3/8 inch of film is allowed to extend below the crown of the central, the film would extend 3/8 inch above the apex, which is usually sufficient.

3. The average minimum vertical angles shown in the accompanying charts are starting, or testing angles. The plane of the surface of the film must also be varied in order to be kept perpendicular to the central ray.

10. *Mandibular Region I.*

11. *Maxillary Region IV.*

Variations in Angulation Produce Distortion

In the upper and lower anterior regions the teeth taper almost to a point at the apex, and at the crown taper labiolingually to a thin edge; the alveolar process is narrower from labial to lingual than in the molar regions.

Experiments have shown that the central ray can deviate from being perpendicular to the long axes of the anterior teeth as much as 10 or 15 degrees without distortion becoming evident. This is especially true if the target distance is 20 inches or greater and the film is kept flat and perpendicular to the central ray.

As the target distance is decreased below 20 inches, variations in angulation produce correspondingly greater amounts of distortion of the teeth.

Supplemental View of the Apical Region—In the upper bicuspid regions (Maxillary Region III on the Technique Chart) the same test is used to ensure extension of the film above the apexes of the bicuspids and first molar. *No* film should extend below the bicuspid crowns.

If the vault is low a higher vertical angle is required which will produce distortion of the crowns of these teeth. However, this film is made chiefly for the apexes of the teeth. (The bicuspid bitewing film is made for the crowns of the teeth in this region).

This is the only distorted film in the series but any one view is not sufficient and this film provides an additional view of the apical regions. The Maxillary Optional Region film eliminates this distortion but the film mounts on the market do not have a vertical window in this region to accommodate the film.

Occlusal Surfaces Used as a Guide—In the posterior regions the broad occlusal surface of the molars are used as the landmark to determine the vertical angle. Variations in angulation of 5 degrees or less can be recognized in the image of these teeth. The occlusal surfaces, therefore, are a reliable guide.

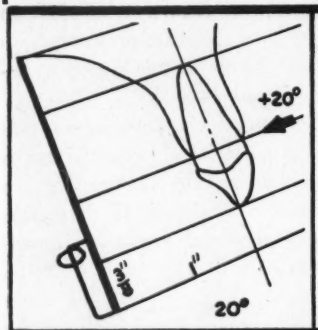
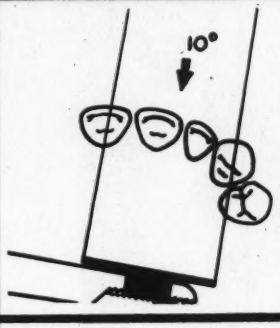
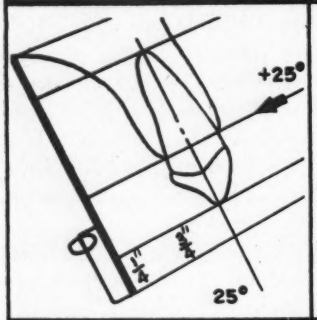
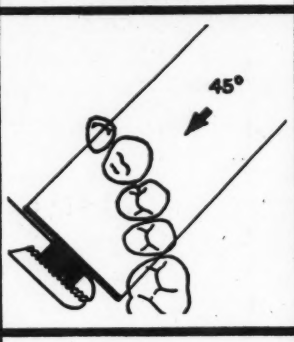
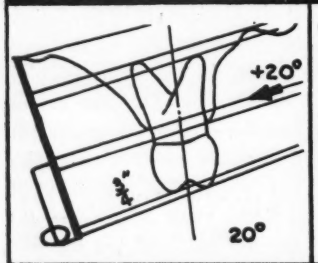
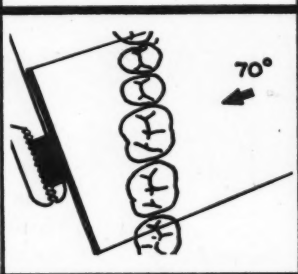
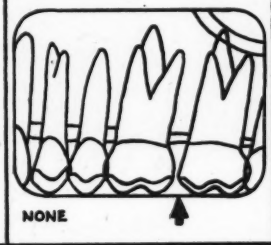
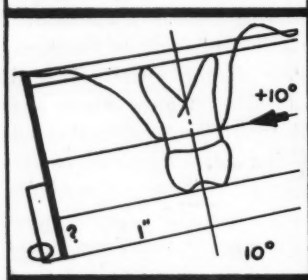
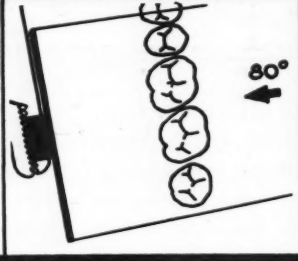
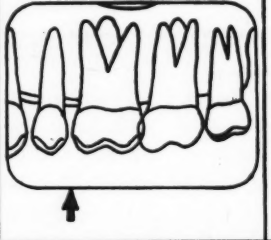
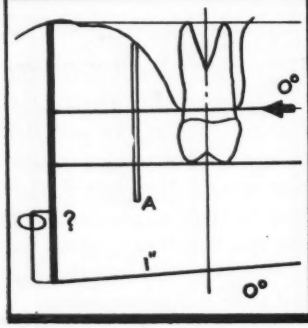
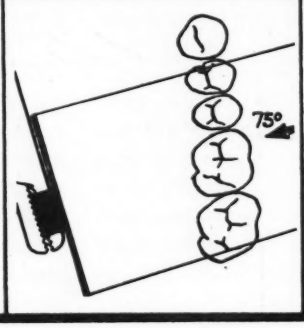
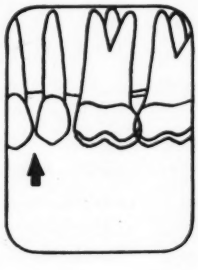
Unless excessive unequal abrasion is present on the cusps, the plane of the occlusal surface of a molar is approximately at right angles to its long axis. As a landmark, it makes for a repetition of the same angle over periods of time.

An Accurate Image: This landmark produces (1) an accurate image of the crown of the tooth, and (2) an accurate relationship of the height of the alveolar process to the neck of the tooth. If the vault is high enough so that the film can extend up beyond the apexes, the image will have an accurate tooth length. This occurs in about 75 per cent of mouths. If the vault is too low, the apexes are not obtained but the film is accurate as high as it extends.

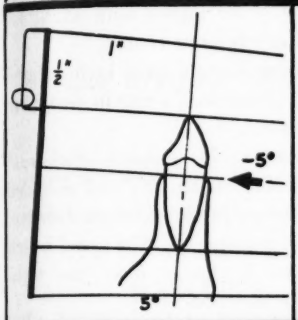
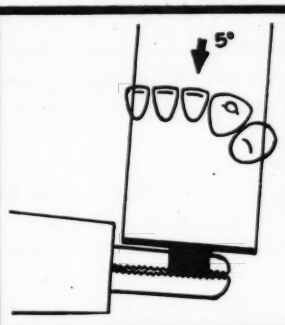
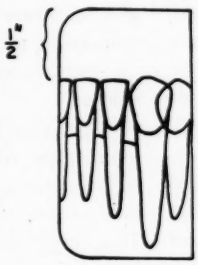
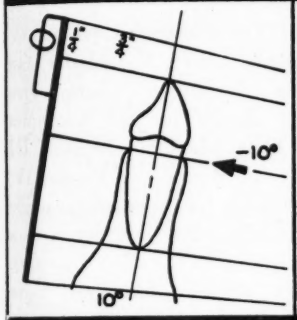
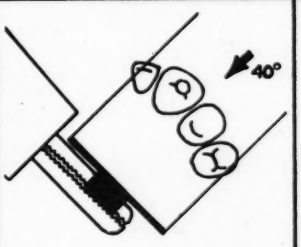
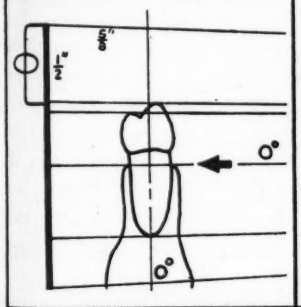
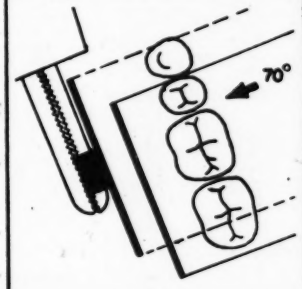
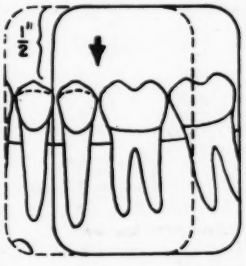
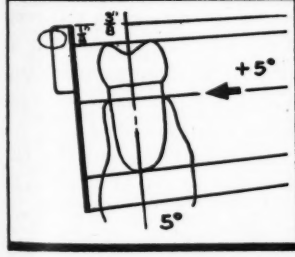
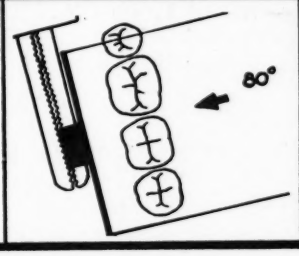
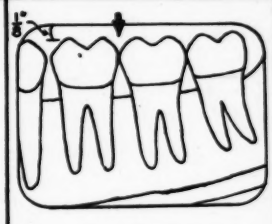
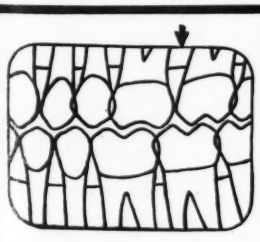
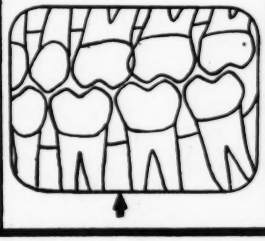
Anatomic Disfiguration Frequent: Regardless of the technique used, there are many mouths where anatomic disfiguration is such that additional films from increased vertical angles would have to be made in order to obtain the apexes, even though distorted. A technique should allow for these variations but they should be made in a way to produce as little distortion as possible.

Guide for Additional Films: The amount of film extending beyond the crowns of the teeth in the posterior region is not a landmark for vertical angulation (except Maxillary Region III) but it does let the operator know (1) if the film is going to extend beyond the apexes, and (2) whether the additional films will be necessary.

MAXILLARY TECHNIC CHART

Vertical-angle and film placement	*Mesio-distal angle and film placement*	*Image on film*	*Angulation landmarks*
			**Region I** VERTICAL — Only ⅜ inch of film should extend below the incisal edges. May have to increase vertical angulation. MESIO-DISTAL — Film should include ½ of adjacent central. Can use vertical film holder with hemostat or cotton rolls, or plastic bite block. Fold dot side of film toward distal on all anterior teeth.
			**Region II** VERTICAL — Only ¼ inch of film should extend below the tip of the cuspid crown. MESIO-DISTAL — Cuspid and the first bicuspid should be centered on the film, although overlapped. This view separates the two roots of the first bicuspid. Hold film as in Region I.
			**Region III** VERTICAL — No film should be allowed to extend below the tips of the cusps of the bicuspids. This distorts crowns but obtains the apices. MESIO-DISTAL — 1st & 2nd molar interproximal space. Use horizontal film holder.
			**Region IV** VERTICAL — Central ray parallel to the occlusal plane of the second molar. MESIO-DISTAL — 2nd bicuspid and 1st molar interproximal space. Film should include tuberosity. Use horizontal film holder.
			**Optional Region** VERTICAL — Central ray parallel to the occlusal plane of the second bicuspid. MESIO-DISTAL — 1st and 2nd bicuspid interproximal space. This film is the most accurate for the bicuspids and first molar, but it seldom extends above the apices, especially if in position "A". Use vertical film holder.

MANDIBULAR TECHNIC CHART

Vertical-angle and film placement	*Mesio-distal angle and film placement*	*Image on film*	*Angulation landmarks*
			**Region I** VERTICAL — Only ½ inch of film should extend above the incisal edges. May have to decrease vertical angulation. MESIO-DISTAL — Lateral incisor should be centered on the film. Use vertical holder. Film must be kept one inch from teeth and in center of the floor of the mouth. Rubber bite block should be kept inside of the cheek.
			**Region II** VERTICAL — Only ¼ inch of film should extend above the tip of the cuspid crown. May have to decrease vertical angle. MESIO-DISTAL — Cuspid and first bicuspid should be centered on the film, sometimes overlapped. Film should be kept back away from teeth and in center of the floor of the mouth. Hold film as in Region I.
			**Region III** VERTICAL — Central ray parallel to the occlusal plane of the first molar (not of bicuspids). MESIO-DISTAL — 2nd bicuspid and 1st molar interproximal space. If possible, include 1st bicuspid on film. Only ½ inch of film should extend above crowns of teeth or it will not extend below apices vertical holder. Keep film ⅝ inch away from teeth.
			**Region IV** VERTICAL — Central ray parallel to occlusal plane of 2nd molar. MESIO-DISTAL — 1st & 2nd molar interproximal space. Only ⅛ inch of film should extend above crowns of molars. Use horizontal film holder or bite block.
	**Bicuspid Bitewing** VERTICAL — Occlusal plane of maxillary first molar, about plus 5 degrees. MESIO-DISTAL — Maxillary 1st & 2nd molar interproximal space, about 70 degrees.		**Molar Bitewing** VERTICAL — Occlusal plane of maxillary second molar, about plus 10 degrees. MESIO-DISTAL — Mandibular 1st & 2nd molar interproximal space, about 80 degrees.

Value of the Right-Angle Principle

1. The right-angle principle can produce results (1) that are not only more accurate for the apical structures, but (2) that are also more accurate for the crowns of the teeth and the surrounding bone structure than the bitewing film because the upper and lower teeth are x-rayed separately.

2. The bitewing film uses a compromise angle for both upper and lower teeth at one time and the film usually has a certain amount of bend or improper inclination.

3. The mesiodistal angles used must also be governed by definite landmarks of which there are three types: (1) Using a definite angle as shown on a scale or meter or by marking the apparatus; (2) by centering certain teeth on the film without regard to any angle; and (3) by directing the central ray through specific interproximal spaces or contact points. Any one of the three types is not sufficient for all areas of a mouth but each method is applicable to certain areas of the mouth.

The tube is also centered mesiodistally by sighting along the central ray through the localizing ring. These landmarks are shown in the technique charts.

Technique

1. In order to use specific vertical angles as starting points, the head must be orientated so that the maxillary occlusal plane is horizontal when x-raying the upper teeth.

2. For the lower teeth the mandibular occlusal plane must be horizontal when the anterior teeth are ½ inch apart, to accommodate the rubber bite-block.

3. The patient should also face directly forward.

4. The hemostat should usually be clamped at right angles to the loop of the film holders, except in Mandibular Region IV. The level to clamp the hemostat on the loop is illustrated by the *oval* drawn on the loop in the column for "vertical angle and film placement."

5. In all areas of the mouth the localizing ring is centered in position before the film is placed in the mouth, in the region of the neck of the tooth.

6. To establish a technique that uses the right-angle principle that (1) will be practical, (2) that will give accurate results, and (3) that will use a minimum of films, all of the features mentioned must be considered.

Apparatus Required—1. A minimum target distance of 20 inches, a target-distance localizer, and film holders are necessary prerequisites. This target distance is now possible when using Eastman Ultra-speed film, as the speed of this film has recently been increased.

2. X-ray apparatus with an output of at least 15 milliamperes and 65 kilovolts is preferable as it allows for fairly short exposure times.

3. Until the manufacturers make certain changes in their equipment, such as longer and more steady extension arms and a higher vertical column, it is preferable to use a mobile x-ray unit and place it directly behind the chair.

If the x-ray unit is placed against the wall at the side of the chair, it will not extend the required 20 inches on the far side of the patient's head, or fold close enough to the wall to do likewise on the near side of the head unless the chair is rotated.

4. The dental operating unit and the cuspidor are a hindrance to the procedure. A separate x-ray room is preferable. In this case a less expensive chair, with headrest, can be used. The room need be no larger than 6 feet square.

Greater Anatomic Accuracy—Regardless of the size of the structure being x-rayed, increasing the target distance beyond 20 inches will result in greater anatomic accuracy. This is difficult to do at the chair.

Table Procedure—1. A room, approximately 5 x 10 feet, with a table 6 feet long, placed along one side near an end of the room can be used as a recovery room after surgery, for anesthesia and surgery, and as an x-ray room.

2. The x-ray unit can be mounted on the wall above the center of the table where it is out of the way when the room is used for other purposes.

3. The table procedure is (1) more convenient for the operator, (2) more comfortable for the patient, and (3) the target distance can be increased to 30 inches with slight increase in exposure time.

Several dentists have incorporated these features in a room in designing their offices.

Alternate Techniques—Richards[9] has carefully evaluated and assigned a conversion factor to target distance, current, voltage, and film speed which facilitates a change from one technique to another.

Use of Technique Charts

1. The Maxillary, Mandibular, and Bitewing Technique Charts give complete details for the minimum twenty films. Maxillary Regions III and IV and Mandibular Region IV, in the column for "mesiodistal angle and film placement," are drawn to a smaller scale than the other drawings.

2. The bitewing films are more valuable if given slightly more exposure time than the apical films of a corresponding region and are then reduced chemically. This gives them more contrast and makes for better comparison with the apical films. The bicuspid bitewing film is necessary if the Maxillary Optional Region is omitted in order to obtain an accurate view of the crowns of the maxillary bicuspids and first molar.

3. The Maxillary Optional Region film is useful when x-raying this area only, as the film can be placed in a single vertical window mount. Rinn mount EZ-24-A will accommodate all of the other films described.

4. In mandibular Region III a bicuspid tooth is illustrated in the column "vertical angle and film placement" to show why its occlusal surface cannot be used as a landmark for vertical angulation (the buccal cusp is usually higher than the lingual cusp). The first molar is used, instead. More depth can be obtained with the film if it is placed mesially

(*Continued on page* 114)

[9]Richards, A. G.: Roentgenographic Technics Made to Order, J.A.D.A. **39**:396 (Oct.) 1949.

ACCIDENT *in an Attempted Extraction of an Upper Third Molar*

JOSEPH E. SCHAEFER, M.D., D.D.S.,
and R. C. RUDDER, M.D., D.D.S., Chicago

DIGEST

In an attempt to remove an upper left third molar the tooth disappeared. The patient was referred to the authors to ascertain the location of the tooth and to complete the extraction.

This case is reported because of the surgical judgment involved. If the tooth was in the sinus, the surgical approach would be through the canine fossa through a window operation. If this procedure was decided on and the tooth was not in the sinus (1) the patient would have been subjected to an unnecessary traumatic operation, and (2) the operator would secondarily have to approach through the buccal sulcus leading into the infratemporal fossae.

X-ray Report

Following the unsuccesful attempt at extraction and the disappearance of the upper left third molar, the patient developed mild symptoms of maxillary sinusitis but did not experience any great pain nor any marked swelling of the face.

X-rays were taken with the following report: 1. Examination of the left maxillary bone showed a third molar tooth apparently within the maxillary sinus or lying in the soft tissues just lateral to the antrum.

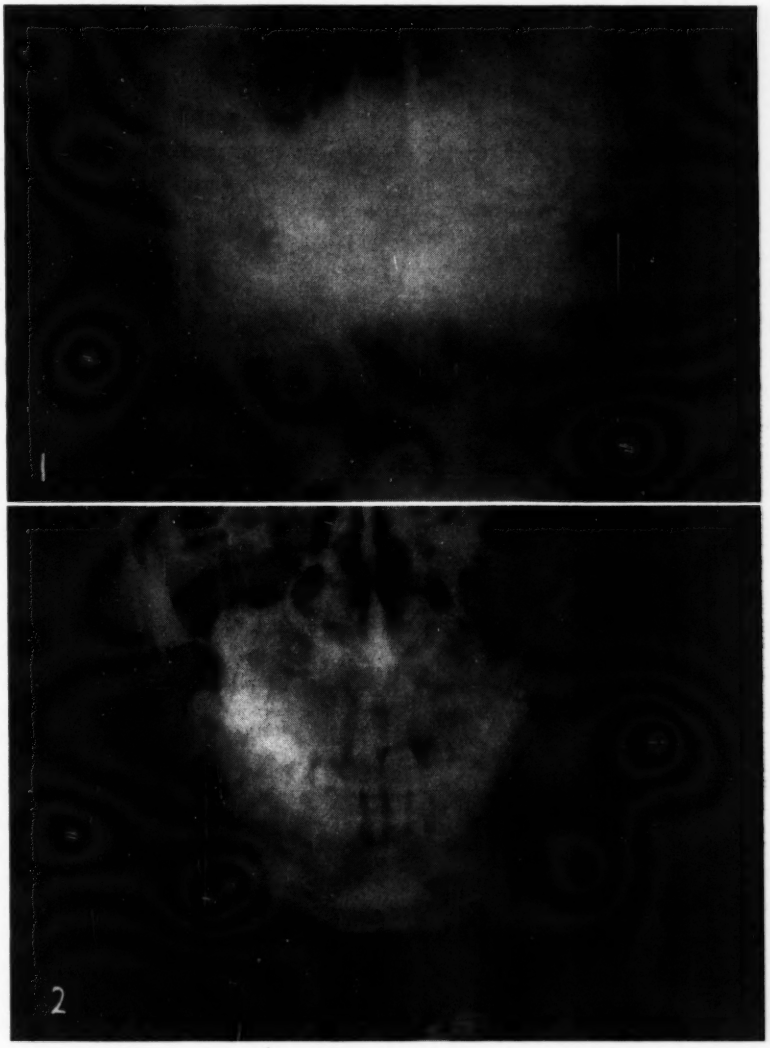
2. The left antrum was filled with fluid or inflammatory exudate.

3. The left frontal and left ethmoid sinuses were also increased in density, probably the result of infection in the maxillary sinus.

Interpretation of X-ray Views

1. The antral symptom would suggest an antral surgical approach but the symptoms could be explained on the possibility that the maxillary sinus could have been entered into in the attempted removal of the tooth.

2. Closer examination of x-ray Number 2 reveals the tooth definitely *outside* the central wall under the malar process. X-ray Number 1 shows a supraimposition of the tooth on the antral shadow.



Surgical Technique

1. The decision was made to approach the tooth from the buccal sulcus. An incision was made over the first molar roots extending well up on the malar process

2. A mucoperiosteal flap was raised and the search for the tooth began. The infratemporal fossa is funnel-shaped so that the tooth could have been pushed farther into the fossa.

(When the senior author was associated with Doctor Vilray P. Blair the latter removed a tooth similarly located from the lateral side of the skull through an incision over the squamous part of the temporal bone).

Diagnosis Challenged—Because of the mechanics of the infratemporal fossa the contraction of the temporal muscle would advance the tooth toward its origin. By carefully dissecting upwards in the fossa with specially contrived retractors with long blades the fossa was entered higher and higher. At one time the temptation presented that the diagnosis was incorrect.

Surgery Continued—1. There was no channel to follow but by carefully spreading the fibers of the temporal muscle and occasionally nipping a few, the dissection proceeded.

2. Finally a small white form was seen which was grasped with a curved hemostat. The object proved to be the apex of the root of the tooth which had become inverted with the crown directed toward the top of the skull.

3. The buccal pad of fat was clinging to the crown of the tooth. This was carefully excised and replaced in the cheek.

4. A long rubber drain was sutured into the deep wound and the lesion was closed.

Postoperative Treatment—The patient was placed on antibiotics and cold compresses. Recovery was without incident.

804 *West 79th Street.*

Teething Troubles

IT IS easy to take the extreme view that teething produces nothing but teeth. In opposition to this opinion is a statement by Still:[1] "I would protest against the tendency nowadays to assume that because dentition is a physiologic process therefore it is incapable of causing disturbance of health."

The following question was recently posed: "Can any infant ailments, beyond local reaction, be justly ascribed to teething?"

Inasmuch as the cutting of teeth appeared to be painful and led to restlessness and sleeplessness it was suggested that in the child predisposed by rickets or by virtue of being an epileptic, convulsions might occur. The evidence for this is clinical observation and the baby is described with occasional twitching associated with swollen soft tissue which ceases when the tooth has come through.

With the virtual disappearance of rickets and a high standard of child care it is likely that this phenomenon is no longer seen by the present generation of pediatricians.

Stomatitis in the Presence of Teething—1. It is possible that inflammation of the mouth is not directly the result of the dentition but is caused by the child pushing infected articles into the mouth in an effort to reduce the pain. Even if indirect, the clinical fact remains that a number of babies have what appears to be some infection of the mouth and gingival tissue during the cutting of a tooth.

2. From the local inflammation spread to the respiratory tract may occur—pharyngitis, otitis, bronchitis, and even pneumonia are mentioned. This phenomenon and the occurrence of diarrhea and vomiting, presumably from parenteral causes, have been doubted.

3. Still is an authority for "bronchial catarrh" and "slight looseness of the bowels" although he states that the causal relation of dentition to various disorders may rest "upon no more solid basis than the observation of many cases."

Associated Symptoms—The occasional pain and fever associated with the cutting of the third molar is also mentioned. With this, as with the majority of healthy babies, disturbances are minimal and it appears that the "diagnosis" of teething is dangerous if made by the unqualified diagnostician and not without its perils when made by doctors. It is obvious that the relationship between dentition and certain upsets cannot be denied although such disturbances may be rare today.

Adapted from *British Medical Journal* No. **4691**:1266-1267 (Dec. 2) 1950.

[1]Common Disorders and Diseases of Childhood, 1927, London.

Intraoral Roentgenology

(*Continued from page* 112)

just far enough to include the second bicuspid, rather than to try and include the distal of the cuspid.

5. It is necessary to have the dental chair at a lower level for the maxillary anterior regions than for all other regions. It is therefore advisable to expose these first. The chair can then be raised, especially if the operator is tall. This also allows the patient to become accustomed to the placing of films and holders in the mouth.

6. If it is necessary to increase the vertical angle in the Maxillary Region I above the starting angle of plus 20 degrees, a corresponding increase will be necessary in Maxillary Region II. Some increase in Maxillary Region III will also be necessary.

7. It is seldom necessary to decrease the vertical angle in Mandibular Regions I and II, or take an extra film in Mandibular Region III to obtain the apexes unless the floor of the mouth is shallow, taut, or sensitive.

586 *East Palm Street.*

CENTRIC *and* HINGE-AXIS

HARRY L. PAGE, Valparaiso, Indiana

DIGEST

Evidence that the mandible operates as a hinged joint in its initial opening and final closing, and proof presented by Doctor Beverly B. McCollum of Los Angeles that it is possible to locate the axes of rotation of the mandible, designated as a "hinge-axis," are factors of extreme interest to the dental profession.

These two factors are of importance in dentistry's chief problem; namely, the articulation of both natural and artificial teeth. Without understanding and utilizing these two principles, it is impossible to articulate teeth properly.

While there are other factors equally important (1) the Bennet movement, (2) maxillary plane, and (3) craniomaxillary apposition, none of which should be neglected, this article deals only with centric and the hinge-axis.

Imaginary Lines

The condylar rotational or hinge-axes are imaginary lines piercing the condyles transversely. Despite the fact that they do not actually exist in a physical sense, they are as important as the rotational axes of wheels and bearings which cannot be seen or touched but which direct, nonetheless, every fraction of an arc through which the wheels or bearings rotate.

Controls Easily Located—These theoretical controls are located easily and measurements without which no modern machine can be built to run efficiently are taken from them.

Dental Applications — Similarly, without first locating the condylar rotational or hinge-axes and utilizing measurements taken therefrom, efficient articulation of human teeth cannot be achieved.

Perfect Interdigitation of Teeth Required

The hinge-axis is not to be confused with so-called centric. Centric is defined as "The most retruded position of the condyles in their fossae from which movements are possible."

However, retrusion of the condyles can be of no value by itself. Simple condyle position or relationship to the fossa is meaningless and useless until it is complemented by a simultaneous and perfect interdigitation of the teeth.

The First Step—Interdigitation of the teeth must be accomplished outside the patient's mouth, on an articulator. The first step is to reproduce in the articulator the exact three-dimensional head relationships that exist between the condyle hinge-axes and the occlusal surfaces. Otherwise, the opening and closing of the articulator as the teeth are being resurfaced or set up will be destructive. This will apply even though the vertical dimension is maintained exactly. The reason underlying this premise is demonstrated in Figure 1.

Figure 1—The articulator, bite-rim, and gothic arch tracing assembly shown in Figure 1 is almost identical with such an assembly shown in an article on articulation published a few years ago by a well-known prosthodontist. According to this authority the case was (1) foolproof, (2) safely locked in centric, and (3) it was asserted that the operator could proceed with confidence to set up the teeth.

Significant Point—The case *was* safely locked in centric. Before the bite-rims were removed from the patient's mouth, a gothic arch tracing had been secured and checked. The bite-rims had been locked together with the tracer pin in the apex of the tracing. There was every reason to be satisfied that the patient's condyles were in "their most retruded position in the fossae."

Yet, Figure 1 demonstrates the significant point that centric in the head and centric on the articulator occupy entirely divergent positions and relationships.

Relationships Differ

The technician will set every tooth in the articulator so that it will interdigitate smoothly and properly with its opponent. Any tooth that does not conform during the set-up will be rotated, tilted, raised, or lowered until it does take its place as a unit in harmony with its mates and opponents.

It is noted, however, that the hinges of the articulator and not centric are dictating (1) how each tooth shall be set, and (2) that the whole will be adjusted to suit *the articulator hinges alone* which bear a relationship *completely different from* the relationship of centric of the teeth.

The teeth will also be set in the articulator so that cusps will clear each other when moving along clo-

sure arcs concentric with the arc B1-B2, the center of which is B, the articulator hinge-axis.

But the jaw will insist that closure shall be along arcs concentric with arc A1-A2, the center of which is A, the condylar hinge-axis. The teeth must comply with the dictates of the latter if the case is to succeed. Otherwise the outcome will be total failure.

Important Point Emphasized—Figure 1 is often objected to on the ground that it shows a set-up made on an obviously unscientific articulator. The illustration is legitimate, however, because of its source and is also valuable as it emphasizes an important point by its gross exaggeration, that is, the futility of centric and all attempts, no matter how sincere and diligent to locate and use centric.

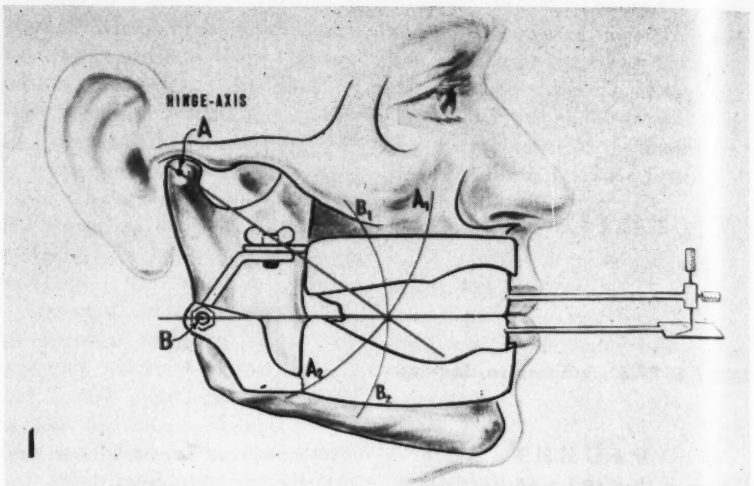
New Methods and Instruments Needed—The points illustrated in Figure 1 should serve to bring to the attention of dentists that none of the methods or instruments in popular use is capable of producing the exact relationships required in articulation.

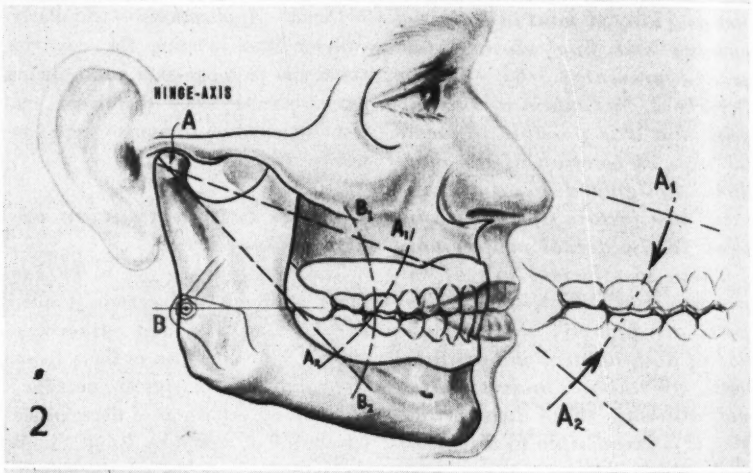
The Object of Articulation

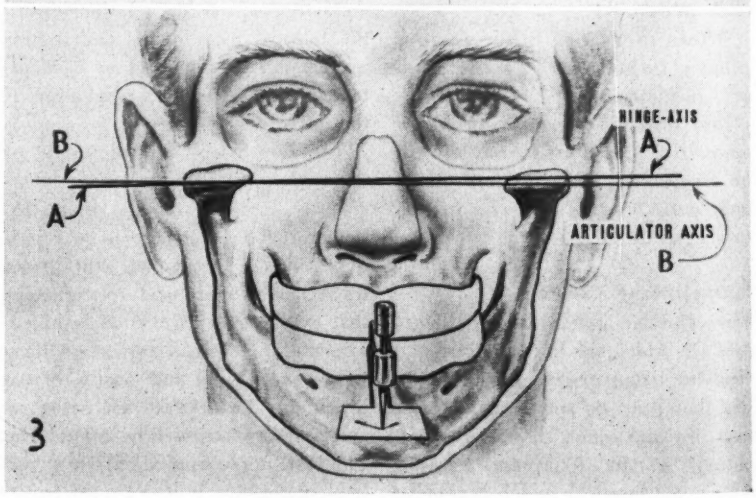
It should be understood by every operator that articulation is the science of making fourteen objects with highly complicated surfaces interdigitate smoothly and terminate perfectly with fourteen targets likewise possessed of highly complicated, dovetailing stops. Precision is of vital importance. Approximation in the controls will not be sufficient and may be even worse than the widely divergent controls shown in the illustrations.

Figure 2—The unsatisfactory results that occur from a dependence upon centric and neglect of the hinge-axis are shown in Figure 2: 1. The articulator hinge relation and the set-up that resulted are shown in phantom. The tooth set-up required for the patient's hinge-axes is represented by the heavy black lines.

2. The arcs of closure upon which the teeth were set on the articulator in no wise agree with the arcs of closure required for the patient's mouth. A clashing of cusps is the un-



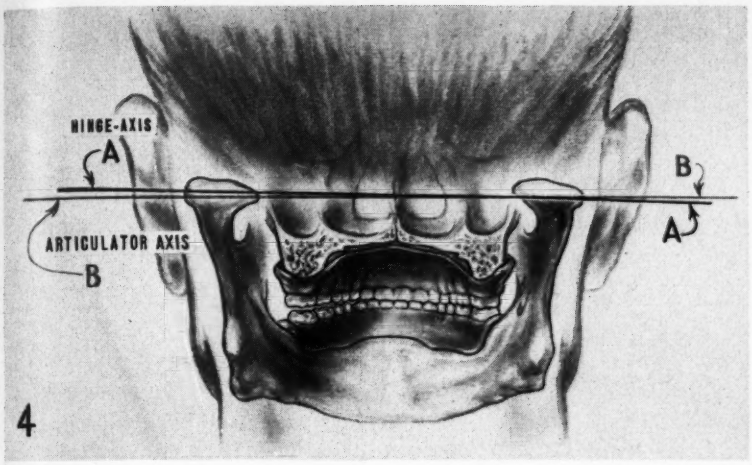




1. ***Importance of hinge-axis. Fallacy of the gothic arch tracing.***

2. ***Occlusal error created unless articulator hinge relation duplicates*** **hinge-axis** ***relation.***

3. ***Importance of hinge-axis. Fallacy of the gothic arch tracing.***



4. ***Occlusal error created unless articulator hinge relation duplicates*** **hinge-axis** ***relation.***

avoidable result. This means failure and mouth destruction.

3. The description pertains to the discrepancy arising through the use of centric as it affects the sagittal-vertical and longitudinal-horizontal planes. The tranverse-vertical and latitudinal-horizontal planes are still to be considered.

4. To be entirely correct, the longitudinal and latitudinal horizontal should be treated as one plane; namely, the horizontal. They are split here for convenience only. The inadequacy of centric and the methods devised to determine centric in the tranverse-vertical plane are shown in Figure 3.

Condyles Never Alined Symmetrically—1. One condyle will be higher, lower, anterior, or posterior to the other. There will be as many asymmetrical combinations as there are human beings.

2. In Figure 3 a situation is assumed where one condyle and its hinge-axis is slightly higher than the other.

3. Referring to the clinician mentioned previously, his bite-rims, complemented by his gothic arch tracing, were locked in perfect centric. However, neither his centric nor tracing even remotely hinted that one condyle was out of symmetry with the other. The articulator in which his case was mounted in preparation for setting up the teeth had symmetrical hinges. Nor could that symmetry have been changed to meet the situation, regardless of the articulator employed.

4. With the teeth set up on this instrument, a discrepancy in the mouth was inevitable. As shown in Figure 4, the teeth come together reasonably well on the side where the hinge of the articulator and the condylar hinge-axis coincide. On the side where the hinges are divergent, the teeth cannot meet.

Conclusions

Dentistry should review critically the premises upon which present articulation concepts are based. Such a review appears even more pressing when results are considered. That they are unsatisfactory is evidenced by the search for other methods.

The realization that articulation at its present level must have covered every possible technique under standard precepts leads to the inevitable conclusion that the results are unsatisfactory, not because the methods are wrong, but because the principles upon which the methods are based are false.

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ORAL DYNAMICS *(Part Three)*

THOMAS H. FORDE, D.D.S., Washington, D.C.

DIGEST

In this installment five major deformities that may occur in the mouth are described, the causes of their existence analyzed, and techniques for treatment in each category are specifically analyzed. A discussion of metabolism and the relation of chronic oral fatigue, a common condition in the present-day human dentition, to bone deterioration, and the various factors to be considered in correction are presented.

The Number 1 Deformity

Description—This deformity begins with the perfect arch. The progressive nature of the deformity may be observed by taking successive models and x-rays over a period of three years. The most striking examples of this condition are presented in the female mouth at thirty-five and in the male mouth at forty years of age.

Biologic Changes—No matter how perfect the arch may be, failure to wear will produce superfluous enamel cusps which will in turn give rise to a sequence of the following biologic changes:

1. The probability is that the upper posterior teeth will begin to expand. The upper third molars, if present, show the greatest buccal deformity by being directed completely off the dental ridge. The upper second molars, which are usually the only ones present, will show a predominant outward expansion from the median line and, in most cases, will be the first teeth lost.

2. The next probability, if the upper teeth hold their positions, is the downward travel in the floor of the mouth of the lowest posterior teeth. These teeth will be found to be depressed as their inclination changes downward and the rate of bone loss will increase. In this type the lower posterior molar will be the first one lost.

3. If the lower teeth begin an overcondensing action, the lower anteriors must become progressively deformed by overlapping and loss of alinement.

4. In the cases where (1) the upper posterior teeth expand slightly, (2) the lower posteriors condense lingually slightly, and (3) the bite collapses or closes, the lower anterior teeth are brought into contact with the upper cingulum of the upper anterior teeth. These pictures will show (1) hypertrophy of the lower gingival tissue accomplished with rapid loss of bone, or (2) the corresponding effect on the upper anteriors, or both.

5. Gradual closing of the bite causes the lower cuspid to strike heavily against the lingual surfaces of the upper cuspid. This forces the progressive crowding and overlapping of the lower anteriors, until the teeth are lost or the condition is corrected.

6. Loss of the labial plate of bone on the upper cuspids results in the retrenchment of bone and recession of the covering membrane or gingival tissue. If the upper cuspid compensates (which frequently happens), the labial plate will condense and thicken and the opposite action will take place on the lower cuspid.

7. Evidence of the ultimate organic result of complete closure is in the presence of every symptom of Costen's syndrome; loss of hearing, and eventual joint ankylosis. The pressure exerted on the meniscus and its proximity to the external ear is a dental responsibility and must be assumed by the dental profession.

Bite Correction—For the Number 1 deformity bite correction should be aimed at absorbing all major stress on the posterior teeth, for the normal side and for the cross bite side. The technique simply involves fundamental methods of grinding inclined planes so that no further tooth movement in either the upper or lower jaw can ever take place.

The Number 2 Deformity

Description—Known as unilateral cross bite, this deformity presents normal relationship of the arch on one side and typical cross bite on the other.

The probability in this case is that the lower teeth on the cross bite side will suffer from undue stress and be buccally deflected. The lower first molar usually shows the greatest bone loss and, as a rule, is the first tooth to exfoliate.

There are many combinations of this one phase. For example, the bicuspids can be in normal position or in cross bite position. This type of deformity can be corrected through grinding. By equalizing strains, the cross bite can become the most suc-

cessful bite of any of the major deformities.

Bite Correction—Diagram 10 describes the combination of (1) the normal anatomic articulation on one side and (2) the abnormalities of cross bite on the other. The normal side now responds to what we can call conventional bite correction technique, which means removal of the buccal cusps on the upper posterior teeth and the lingual cusps on the lower posterior teeth.

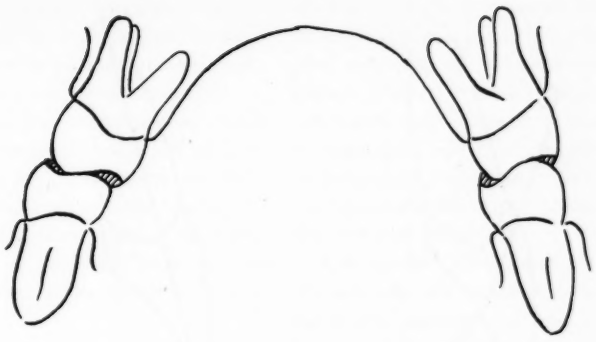
Correction on the Cross Bite Side: This can best be described by inverting the study model. (1) Bite correction here involves the inclined planes of the lower buccal cusps and upper lingual cusps, with a reduction in height of the lower buccal cusps. This removes the danger of buccal depression of the lower teeth and instantly reduces the buccal strains against the plates of bone that support the lower teeth. (2) The buccal inclined planes of the upper cusps are reduced and slightly inclined. (3) The lingual cusps of the lower posterior teeth are shortened and ground slightly on the lingual surface.

The bite correction indicated by the shaded areas in the diagram is designed to nullify the compression of food morsel that would cause bone destruction from undue or unreasonable stresses.

Reduction of the Anterior Teeth: Once the biologic changes have been arrested in the posterior regions of both sides, it is a simple matter to reduce the anterior teeth at the expense of either the lowers, the uppers, or both, whichever is indicated by the location of the fulcrum point as revealed by x-ray.

Example: If the x-ray shows (1) excessive bone loss on the lower teeth, (2) that the fulcrum point has dropped to an obvious point far below the cervical line, and (3) that at the same time the upper teeth show little or no bone loss relative to the fulcrum point, it is absolutely imperative that the correction be made at the expense of the lower teeth.

The Value of Shortening: Any shortening of these teeth will be highly beneficial, and the shortening should be carried out to the limit of tolerance, refraining, of course, from taking any of the teeth completely out of function in the protrusive movement of the lower jaw.



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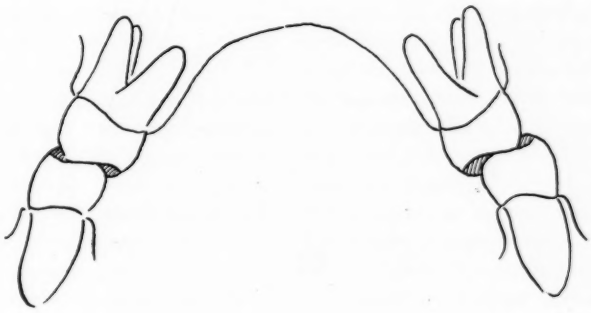

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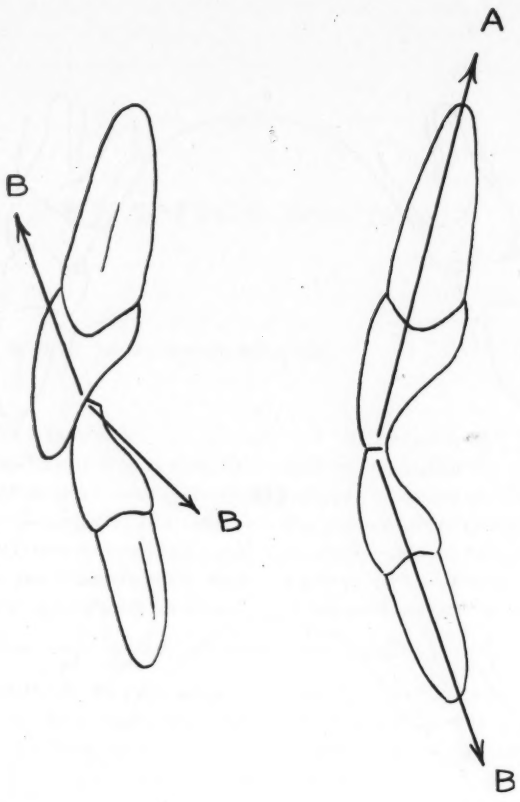
The Number 3 Deformity

Description—Bilateral cross bite favors the upper posterior teeth. There is seldom a case that shows any expansion of the upper arch. The inclination of the upper teeth is almost perfect, and the teeth are in line to receive the maximum blow from the mastication muscles.

Exceptions: There are exceptions when the upper teeth will show periodontal difficulties; but these cases usually result from the profound interlocking of the cusps where the lateral movements of the jaw destroy the investing tissue. Bilateral cross bite seldom involves condylar problems. In this situation the mandible has been expanded so greatly that the condyles, even if directed backward, would miss any structures of vital importance to the functioning of the external ear.

Exfoliation of the Lower Teeth: In the bilateral cross bite deformity the probability is that the lower teeth will be exfoliated first, unless radical wear has taken place. In this event the structures will show (1) remarkable density, (2) great masticating efficiency, and (3) little or no periodontal involvement in either the upper or lower teeth.

A Favorable Alinement: While this



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alinement is considered (and recognized) as distinctly abnormal, the author looks upon this particular cross bite with great favor. It responds readily to grinding technique and little or no difficulty arises from it in later years.

Bite Correction—Bilateral cross bite requires the same treatment as described for unilateral cross bite. Reference is made to Diagram 11 in which the shaded areas describe the correction essential to the achievement of complete harmony, i.e., the strains exerted in the act of mastication must be controlled.

The Number 4 Deformity

Description — Orthognathous deformity is characterized by a distal deformity of the entire lower mandible.

The retracted position of the lower jaw permits an easy and early collapse, frequently allowing the lower anterior teeth to strike the gingival part of the cingulum of the upper anteriors or lingual to the upper anterior teeth at varying degrees, according to the deformity. Frequently in these cases the sharp incisal edge of the lower teeth strikes in the region of the rugae and causes perpetual inflammatory lesions.

Functional Restoration Hazardous: Most victims of the orthognathous deformity find it impossible to incise and a condition of disuse atrophy results from the absence of stimulation in the upper and lower anterior teeth. Owing to the lack of bone density, functional restoration of this type of deformity is extremely hazardous and must be continued over an extended period of time.

Early Treatment Advised: These cases can best be treated in early adolescence when either one or both of the first bicuspids should be removed. It is possible to correct the condition through surgery alone. Otherwise the first bicuspid on each side is usually taken out and six anterior teeth are set back in position through adult orthodontia.

Bite Correction—The orthognathous problem is extremely complicated. The study models will plainly show the element of interference. Through adult orthodontia (1) the upper teeth can be moved back, (2) the lower teeth can be splinted, or (3) restorative measures can be used to open the bite and free the patient from the complicated, nonanatomic arrangement of his teeth.

The Use of Splints: In these cases the use of splints permits forward travel and development of the mandible. The splint opens the bite to the required dimension and permits the mandible to become free in its forward travel. Once the mandible is released from interlocking cusps and the bite opened, its natural tendency will be to advance forward, restoring the valuable profile dimensions and making a marked improvement in the efficiency of mastication.

Adult Orthodontic Technique: 1. The correction of the upper teeth usually calls for the removal of one or both bicuspids.

2. The teeth are then set back more as a unit in mass movement of bone.

3. The adult orthodontia technique involved depends upon splints which are specially cast for each individual case.

4. When the correction is accomplished, the splints are removed and replaced by retainers as a safeguard to the teeth until they are fixed firmly in functional position.

5. Completion of such a case cannot be accomplished in less than a year.

The Number 5 Deformity

Description—Prognathous deformity is characterized by protrusion of the mandible which places the lower incisors anterior to the upper incisors. This deformity is usually accompanied by a cross bite or a combination of normal on one side and cross bite on the other. Invariably the functional posterior teeth are found strong

and healthy with a condition of disuse atrophy of both the lower and upper anterior teeth.

Cases showing a slight prognathous tendency due to an improper biting habit are frequently misdiagnosed as true congenital prognathism. The criterion for diagnosis of the prognathous deformity is the inability of the patient to bring the lower jaw back to an end-to-end bite position.

Bite Correction—Adult orthodontia in early life is indicated, even at the expense of the lower bicuspids in cases where deformity is too extreme. Bite correction is definitely indicated and extremely complicated, depending upon the position of contact between the lower and upper posterior teeth.

Correction Aimed at Nullifying Bilateral Interference.: The prognathous deformity is exemplified by numerous combinations of posterior teeth, but particularly favored as far as stress absorption is concerned. Bite correction should be aimed at nullifying bilateral interference. The combination involves (1) unilateral cross bite, (2) bilateral cross bite, or (3) combinations where the molars are in cross bite and bicuspids in normal relationship. Bite correction must be suited to the individual study models and based on the application of the simple laws of impact against inclined planes.

Stereotyped Techniques Impossible: The fundamental description previously given should sufficiently prepare the reader to determine where the complicated action will take place when an inclined plane is struck by force of impact. Bite correction in such cases must rely on the simple study of physical, mechanical problems involved. A completely stereotyped technique is impossible.

Metabolism

Metabolism can be described by comparing the body cells to a storage battery: 1. The battery is constantly charged while the motor is operating; this phase represents the anabolic phase of metabolism. 2. The initial starting energy required to turn over the motor is the working phase and is comparable to the catabolic phase. 3. Metabolism of early youth can be compared to a battery deriving energy from many generators. Such a battery can be called upon for continuous service without endangering a condition of complete discharge.

The Law of Compensation—Adult life must respond to the law of compensation; again, for every act there must be an equal and opposite re-act. Adult metabolism permits the working cycle, or discharge cycle, to continue as long as the recharge cycle is equal to it.

The cosine curve, so commonly used in the description of the alternating current, shows a plus sign above the line and a negative sign below. The ammeter on the automobile registers negative when the input is below the output; neither the body cell nor the battery cell suffers as long as the two are equal.

However, when the negative phase becomes greater than the positive, either the body cell or the battery must automatically draw on residual energy. It is highly destructive in both cases if the recharge cycle is not immediately replaced.

Usefulness of the Catabolic Phase—1. The catabolic phase is by no means an enemy to cellular existence. 2. It removes worn-out cells and waste products. 3. While scavenger in character, it is nevertheless of equal importance to the anabolic phase. 4. It responds to adverse stimulation and is highly destructive when its compensating or anabolic phase is neglected or absent.

Functioning Through Pressure—Bone cells are removed rapidly in the catabolic phase, and once removed they can never again be replaced as far as present knowledge is concerned. We therefore return to the question of function through pressure, referring again to the diagram that shows how a tooth can operate faithfully without fatigue if functional conditions are permitted to operate as Nature intended.

Fatigue

Perhaps the most common complaint in the civilized human dentition is chronic fatigue which starts almost immediately after the arches reach their full development. This does not include eruption of the third molars. The sharp angular pinnacle-like cusps set up a mechanical efficiency greater than the supporting structures can withstand. A condition of expansion, recognized in this work as progressive deformity, continues as the forces are incorrectly absorbed by the inclined planes.

Progression of Fatigue in Bone Tissues—In the muscles of the body there are reactions of pain and fatigue to give warning of a condition of overwork. But in the bone cells, fatigue is a silent worker, giving no warning to the autonomic nervous system of the destructive process that is under way. Metabolism is the sole indication of the progression of fatigue in bone tissue. It can be detected in its early stages by x-ray. Successive pictures will show the deteriorating effects of the catabolic phase long before edema, engorgement, or stagnation appear in the visible areas of the mucous tissue. The fatigue process precedes bleeding or any visible clinical symptoms.

Element of Fatigue Reduced in Nature—A condition of fatigue was never permitted by Nature to exist. Nature invariably balanced the working arm of the tooth against the supporting arm and kept the law of the lever inviolate. Modified planes, developing into flat planes, progressively reduced the element of fatigue and increased the efficiency of the triturating apparatus. But civilization with its superatomic intelligence and supersonic speed casually continues to violate the simplest of elementary laws: the fundamental law of the lever.

Interrelated Pattern—The interrelationship between impact, metabolism, and fatigue is indicated in the following pattern:

(1) The impact on the tooth determines its destiny. It will either survive or exfoliate, depending entirely upon how it receives and absorbs the blow.

(2) If the blow is absorbed properly and the blood supply is normal,

the environment remains alkaline and operates as a barrier against bacterial invasion. Under such conditions there is no strain on the ligaments and therefore no strain on bone and no interruption in metabolism. This leads to consideration of the following:

As long as tension on the ligaments is physiologically normal and metabolism of bone is physiologically normal, there can be no fatigue.

Too Strict Obedience to Tradition a Barrier to Progress—If the cycle described is within the range of every dentist to fulfill, it is difficult to understand why dental tradition is still powerful enough to prevent the average dentist from making the greatest contribution possible for him to offer: service to his patients. He need not accept the statements of man; he need only consult the great libraries of Nature found in museums and primitive graveyards all over the world. This library is unblemished, nonpolitical, nonreligious, and in every respect uncorrupted by the mind of the human being.

Misuse of the Muscles of Mastication

The Natural Toothbrush—The act of mastication, carried out under conditions that Nature planned, serves a prophylactic function. It stimulates the mucous tissues and furnishes (1) the proper blood supply to the periodontal membrane, and (2) the proper method of ridding the mucous membrane of its venous blood. The masticating act under these conditions is still the best toothbrush that could be designed for the entire masticating apparatus. It should never be forgotten that the natural toothbrush is millions of years old.

The Masseter Muscles—The destiny of the masticating apparatus is largely determined by its capacity to use the energy supplied by the masseter muscles. The number of foot-pounds of energy used by these muscles is enormous. Calculating the normal life expectancy of the average human being, the amount of energy dissipated through the masseter muscles alone would run into millions of foot-pounds. It is of the greatest importance that this energy should be properly directed, not only for the purpose of mastication, but for all the multiple purposes for which it was intended.

Variety of Services—The act of mastication is only one service rendered by these muscles. They can either prevent or contribute to fatigue. They must either build greater bone density as life reaches maturity, or they must destroy the processes that support the teeth. The determining factor is absolute control of the impact to provide the full measure of benefit intended by Nature.

Unilateral Mastication

1. The muscle imbalance created through unilateral mastication is (1) progressive, (2) highly destructive, and (3) one of the principal causes in the ultimate exfoliation of the teeth.

2. Condylar deformities resulting from unilateral mastication are extensive and produce varied symptoms that are not likely to be investigated in the mouth itself.

3. Many patients are treated for migraine headaches, ear involvements, and various forms of facial neuralgia as a direct result of misuse of the muscles of mastication.

Case History—The following case is cited as an example of the catastrophy that can result from the loss of one tooth: A young patient with a badly infected lower left first molar consulted a dentist, who, of necessity, recommended removing the tooth. No mention was made of restoring the missing unit for both patient and dentist assumed that there was still adequate chewing surface left in the mouth.

Change in Mastication Habits: The resulting condition was soon forgotten but the protective value of the arch phenomenon was destroyed by virtue of the missing segment: The masticating habits take the path of least resistance and as the right side possesses greater efficiency, it is gradually forced to assume more and more of the burden of mastication. This means that the muscles (not only the powerful masseter but also the buccinator and a part of the lingualis) gain in strength and efficiency. The habit becomes more deeply entrenched until it is beyond the conscious control of the patient and no matter how much effort he exerts, it is virtually impossible to resume bilateral mastication.

Ensuing Cycle of Events: (1) The median line changes, (2) the upper teeth on this side of the ridge develop a buccal inclination, (3) partial atrophy affects all the structures on the left side, with a conspicuous characteristic of the buccinator.

A Lack of Symmetry: There is a general loss of symmetry with obvious differences in facial tonus and cheek wall dimensions. Worst of all, there is an overstimulation and fatigue of the teeth on the right side, with a lack of stimulation to the teeth on the left side. Actually, a patient who simultaneously loses both lower first molars is in a better condition than one who loses just one lower first molar, for the bilateral deformity is not nearly as damaging as the unilateral deformity.

Muscle Imbalance—(1) Metabolism, (2) condylar deformity, (3) periodontal breakdown, and (4) cosmetic disharmony are involved in muscle imbalance which should be of great concern to every dentist. Almost all patients display immediate interest in the probable results if they are predicted at the time a tooth is removed.

In the example cited, muscle imbalance is not the only deformity that results: The upper first molar on the left side immediately elongates and projects downward into the missing space, creating a lock that ultimately inhibits the natural freedom of the mandible.

The Elongated Tooth a Dental Enemy—Perhaps the worst case reconciled by the dental profession is the one in which a dentist replaces a lower first molar and perpetuates the deformity of the elongated upper first molar rather than grind the tooth back to its normal position and curve.

The reluctance to grind human teeth extends to a point where a den-

tist elects to perpetuate a deformity rather than grind superfluous and undesirable structures which create the most unsatisfactory condition that could possibly exist in the mouth.

The elongated tooth is an enemy to healthy dentition and should be cut to its proper level, even if an onlay is required to repair the sensitivity created by necessary grinding.

Causation not Sufficiently Considered in Treatment—(1) Disuse atrophy, (2) fatigue, and (3) overfunctioning and its resultant deformities are among the principal causes for this unilateral loss of the human dentition. The dental profession employs every known therapy in treating the effects produced by these factors. It then becomes reconciled to the loss of the teeth as a factor beyond human control, usually attributing the loss to longevity or living beyond the normal life expectancy.

Causation is not considered in the treatment and the progressive deteriorations are passively followed until they reach a pathogenic stage that necessitates removal of the remaining teeth in order to save the patient's health.

Accompanying Factors Accelerate Rate of Loss—The Number 1 deformity previously described is sufficient within itself to cause the loss of the full complement of teeth without the existence of a single cavity. When this condition is accompanied by muscle imbalance, the rate of loss is accelerated and the damage is more extensive.

Treatment in Early Adult Life—Returning to the original premise on which this work is based, it is not only necessary (1) to institute bite correction in early adult life, but (2) to replace any missing tooth to maintain arch continuity and bilateral masticating function.

Patient Education—The dentist need not specialize in salesmanship and psychologic methods of persuasion if he concentrates on the ultimate damage that can be done to the mouth if the unit loss is neglected. Few health-conscious patients would ignore his warning if it were placed on an understandable professional and scientific basis. The patient must be forced to realize that the loss of one unit in human dentition begins a process that will never end until the rest of the units are exfoliated. This realization will produce a more favorable reaction than all the salesmanship the dentist can exercise.

Facial Contour a Factor in Diagnosis—Muscle imbalance is conspicuous from the standpoint of facial disharmony. The dentist should recognize this condition at first sight, before looking into the patient's mouth. Facial contours show (1) loss of vertical dimension, (2) disuse muscle atrophy, and (3) overdeveloped masseters and buccinators. The position of the condyle in relation to the external auditory meatus is a definite part of the dental examination.

Additional Factors in Diagnosis—

1. The study models of the unilateral masticator will show a marked deformity on the side that is in function.

2. The upper posterior teeth will be found off the ridge, progressively from the cuspid to the third molar, while the teeth in disuse will probably remain on the ridge.

3. The teeth under greater strain are likely to be the stronger teeth if the condition has not continued too long. The teeth in disuse are likely to be weaker and subject to greater periodontal injuries.

4. The cheek on the working side will be thicker and well enervated, while the cheek on the disused side will be thinner, loose, and drooping along the lateral borders of the body of the mandible.

5. The median line is likely to be off center in favor of the working side.

6. Lower study models will show a disharmony in the mandible, with the working side of the arch disproportionate to the unused side.

7. Diagnosis of this condition rests on a thorough examination of the facial characteristics as well as study models and x-rays.

8. Conclusions reached must include the restoration of function to the side in disuse and a reduction in masticating efficiency on the side that is overworked.

The Act of Incision

Perhaps the most common deformity is found in the act of incision. The obvious character of this deformity has made little impression on the dental profession. If the anterior teeth are usable at all, it seems to be sufficient for the average dentist. Exactly *how* they are used is apparently of no importance; the fact that they shear instead of cut in an end-to-end bite is overlooked, although the act of shearing is a definite deformity and is so treated in this work.

End-to-End Bite in Cutting is Normal—Almost every dentition, unless malformed, would normally enjoy the proper end-to-end bite in the cutting act. However, the length of the cuspids, particularly the lower ones, interferes with the forward travel of the mandible, and the only contact possible is a sliding contact wherein the teeth cut in a sheering action comparable to the cutting action of a pair of scissors.

Thrust Improperly Directed—This act, though efficient, invokes the full law of the lever against the fulcrum point of the teeth. The thrust, instead of being directed along the long axis of the roots, must be absorbed along the lingual wall of the lower roots and the labial wall of the upper roots. This is wrong from every standpoint, (1) metabolism, (2) blood supply, and (3) the resulting fatigue that will ultimately destroy the respective processes.

Diagram 12—Through cross-section the direction is shown in which the stress is absorbed in the force of shearing. The second figure in the diagram shows the direction in which the force is absorbed in an end-to-end cutting act. Grinding of the anterior teeth performs two vital services: (1) Elimination of the deformity caused by misuse, and (2) stimulation which results in removal of fatigue.

All Pressures in Centric Relationship Must be Controlled—Forces which are not compatible with the

absorptive powers of the periodontal membrane should never be allowed to exist in the anterior teeth.

It is therefore necessary to correct not only the act of shearing, but all other pressures in centric relationship. The latter cannot always be achieved through simple grinding. (1) Biologic openings, (2) permanent splints, or (3) other restorative measures may be needed in order to maintain the proper freedom that the anterior teeth must enjoy. Their only functional act under pressure should be an end-to-end contact as used in cutting, creating the relationship which is necessary for their continued existence.

Law of the Lever Involved in the Use of the Anterior Teeth—In the act of shearing the entire working arm of the tooth is straining against the supporting arm. As previously described, (1) the fulcrum point is the point of departure from solid bone, and (2) regardless of where this point is located, all parts of the tooth from the fulcrum point to the cutting edge must be considered working arm.

The Law in Force—If the force is absorbed in the direction of the arrow (B) the full power of the law is in force and the supporting structures that retain the teeth must absorb strains that are normally beyond their capacity. The law itself is inviolate and cannot be compromised. Yet in the normal act of incision the law is virtually nullified. The arrow (A), as shown in the correct impact figure in Diagram 12, does not involve the fulcrum point to any great degree. The investing tissues are absorbing the load in a vertical position, or a position parallel to the long axis of the tooth.

No Violation of this Law Advised—There is no attempt in this work to advise any method of violating this law. Strict observance of its requirements is strongly advocated.

The Act of Shearing—The first figure in Diagram 12 shows the teeth in an act of shearing: 1. The lower teeth make a sliding contact against the lingual surfaces of the upper teeth and continue to travel in such a manner that the strains are absorbed on the labial surfaces of the lower teeth and the lingual surfaces of the upper teeth.

2. If the teeth were made of rubber, the lower teeth would bend lingually and the upper teeth would bend labially at their respective fulcrum points.

3. If the teeth were stopped in this position they would present a picture of the condition which will ultimately exist after this habit has persisted for a number of years.

Correct Method of Incision Illustrated—The diagram shows the teeth placed in the functional position they can tolerate without bone loss. A progressive condition of bone destruction resulting from the abnormal shearing act can, if it has not advanced too far, be completely arrested by corrective grinding. When proper incision is restored the existing periodontal lesions will heal without medication other than a satisfactory prophylaxis.

A Preventive Measure—Ideally, bite correction aimed at perfecting the act of incision is a preventive measure and should be introduced before periodontal destruction occurs.

However, bite correction can be employed therapeutically after destruction has taken place, provided the working arm itself is not beyond control: 1. Bone loss must not have progressed more than halfway between the cervical line and the apex of the root of the tooth. 2. More explicitly, the fulcrum point, found at the cervical margin, can drop halfway between this margin and the apex before the patient reaches what is commonly called a borderline case. In this situation bite correction is instituted and it is probable that the patient will enjoy a degree of success.

Example of the Power of the Lever—Referring to the first part of Diagram 12, the following example is cited to show the power of the law of the lever: 1. Taking arbitrary figures, a hundred-pound blow against a tooth in the direction of arrow B will force the root to absorb a hundred pounds against its lingual wall, subjecting the labial fibers to extreme tension and compression.

2. A sufficient number of blows of this type, even though intermittent, will cause the tooth to move in the direction in which the force is applied.

3. According to the example, the root absorbs a hundred pounds of pressure when the fulcrum point is located at the cervical line.

4. If the bone drops halfway between the cervical line and the apex of the root, the working arm will be increased by fifty per cent and the remaining part of the root will be forced to absorb at least 150 pounds of pressure although the initial force applied has not been increased at all.

5. The reduced root area expedites the loss of bone. Now the catabolic phase of metabolism is operating and the element of fatigue is hastening the removal of the tooth by the process of exfoliation.

6. All symptoms of periodontoclasia will appear in the visible areas and as the process of exfoliation nears completion a perfect picture of pyorrhea will manifest itself, regardless of all medication that can be applied.

The Correction Indicated—The second part of Diagram 12 showing proper impact, indicates the correction necessary. The same example is cited: 1. In this case if the bone level dropped halfway between the cervical line and the apex of the root, the strain on the remaining bone would increase, but not in geometric proportion because the law of the lever is not involved to any great extent.

2. The forces are directed downward along the vertical axis of the root, and the fulcrum point in this case is not a critical issue.

3. The chance of arresting bone loss under this condition is favorable. In relieving the element of strain the dentist does not have to deal with the catabolic phase of metabolism.

4. The teeth cannot be used for tearing purposes, but they can effectively cut the normal food in the average civilized diet.

5. The teeth in this condition are more or less crippled but can be

successfully retained under conservative and useful conditions.

Progressive Deformities Compared to Common Mouth Malformations

Most malposed teeth are conspicuous and outstanding. The dentist is trained to recognize these deformities but is not trained to recognize progressive deformities.

Means for Detection—Progressive deformities are detectable through study models taken at yearly intervals (or even at six-month intervals) and can be visually recognized by comparison over a period of three years. Yet these are the deformities that are most commonly neglected until the damage is beyond repair.

The Importance of Early Detection Emphasized—Almost all progressive deformities can be completely checked before the critical stage is reached.

The Value of Orthodontics—Adult orthodontia is of great importance in the treatment of progressive deformities. The age of the patient has no bearing on the effectiveness of treatment if the deformities are discovered before the investing tissues have been irreparably damaged. Orthodontic appliances, known as splints, are indicated and commonly used to control different types of deformity.

Bite Correction Often Sufficient—The common malformations are subject to treatment through adult orthodontia. Most of the progressive deformities, if detected in time, can be treated without orthodontia.

In many cases bite correction is sufficient to maintain the teeth in a physiologic position in which they can function without fatigue throughout the normal life cycle.

(*To be Concluded Next Month*)

5510 16*th Street, N.W.*

Treatment of the Common Cold

THERE ARE no specific remedies for minor infections of the respiratory tract. Many traditionally used remedies still are in vogue, some of which actually may be harmful. Of these, one may mention the old custom of purgation, diuresis, and sweating "to get rid of the poisons."

A number of ancient and modern remedies bring about symptomatic relief and comfort and do not cause harm if properly used. These include the use of (1) poultices and mild counterirritants, or heat applied more simply and just as well, if not better, with an electric pad. Heat, like alcoholic beverages, causes vasodilatation and gives a sensation of comfort and relaxation. (2) Aspirin relieves headache and aching. (3) Coughing can be controlled by cooling and humidifying the air, spraying the throat with warm isotonic salt solution, or, if harassing, by giving codeine sulfate. (4) Nasal obstruction and rhinorrhea may be relieved by the inhalation of vasoconstrictors or by instilling them into the nares in aqueous solution. They should be used infrequently and only to the point of opening the airways.

The need for bed-rest is uncertain. Some persons suffer less inconvenience and discomfort if they remain up and about, but, in so doing, they spread their infection to others and run the risk of secondary infection themselves. Rest in bed is important if fever is present, and particularly in patients who have other chronic disease, and in aged persons.

From *The Merck Report* **60**:7 (January) 1951.

Blood Sedimentation Rate

THE BLOOD sedimentation rate is one of the best laboratory tests that we have because so often it warns the physician that he is dealing with a serious condition.

Usually any blood sedimentation rate over 35 millimeters in an hour (Westergren) calls for a very careful study of the patient, with x-ray examinations of all parts of the digestive tract from the mouth to the anus. Fortunately, in many cases, even a rate around 35 millimeters is due only to a moderate amount of arthritis.

Any serious illness is likely to run the sedimentation rate up. A high rate right after an attack of severe pain in the chest points to a myocardial infarct. Apparently the absorption by the body of dead tissue of any kind is likely to send the rate up. Ocasionally a high rate is due to a patch of pneumonia, or perhaps to a bad cold.

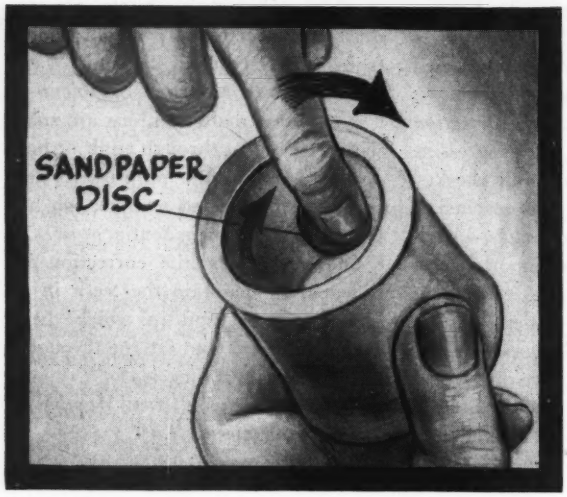
The sedimentation rate is very helpful after the removal of a breast or part of the bowel for cancer. If in the next 6 or 12 months the rate goes down, the patient can be much encouraged; but if it keeps going up, the outlook is bad.

The sedimentation rate is helpful sometimes when some abnormal cells are seen in the blood smears and one wonders if a leukemia is starting.

Naturally, like all tests, this one is not infallible. On occasions one will see a person with metastatic carcinoma who has a blood sedimentation rate under 30 millimeters in an hour (Westergren), and occasionally one will see a person with a blood sedimentation rate of 50 millimeters in an hour (Westergren) with no cause that can ever be determined. A few such persons have been observed over a period of years, and as yet have not developed anything serious.

To repeat, the blood sedimentation rate is more sensitive to infection than a leukocyte count. It quickly picks out the people who are dangerously and seriously ill.

From GP **3**:54 (February) 1951.



1

Clinical and Laborato

Cleaning the Amalgam Mortar

Norman W. Bain, D.D.S., Philadelphia

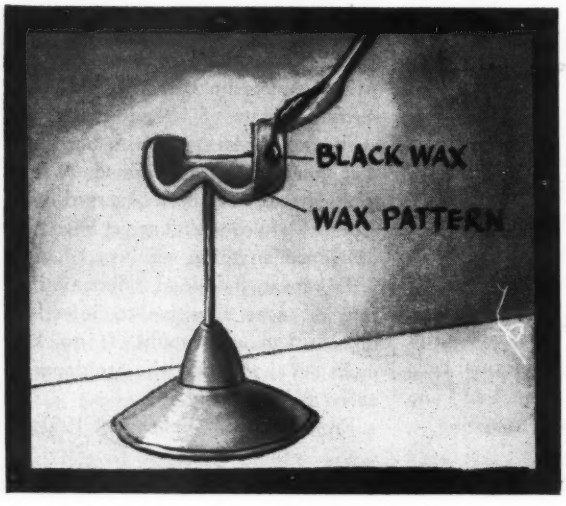
1. To remove adhering particles of amalgam from a glass mortar, rub an ordinary coarse sandpaper disc around the mortar with the forefinger.

2

Use of Modeling Clay in Denture Repair

F. V. Williams, D.D.S., Olathe, Kansas

2. It is often difficult to place the broken edges of a denture in correct apposition and hold them in that position while waxing them together. Using a small amount of modeling clay, flatten it out into a saucer shape, then by placing the pieces upon the clay it can be manipulated into any shape to hold the broken parts in proper position before waxing.



3

Securing Inlay Contact Points

Ford T. Johnson, D.D.S., Lawrenceville, Va.

3. To facilitate the establishment of contact points on gold inlays before casting, the use of black carding wax is suggested. The melting point of black wax is considerably lower than that of regular inlay wax and hence no distortion of the wax pattern will occur.

READERS *are Urged to Collect* $10.00

For every practical clinical or laboratory suggestion that is usable, DENTAL DIGEST will pay $10.00 on publication.

You do not have to write an article. Furnish us with rough drawings or sketches, from which we will make suitable illustrations; write a brief description of the

SUGGESTIONS . . .

Cutting Down Operating Noises

Gordon S. Anker, D.D.S., Toronto, Ontario

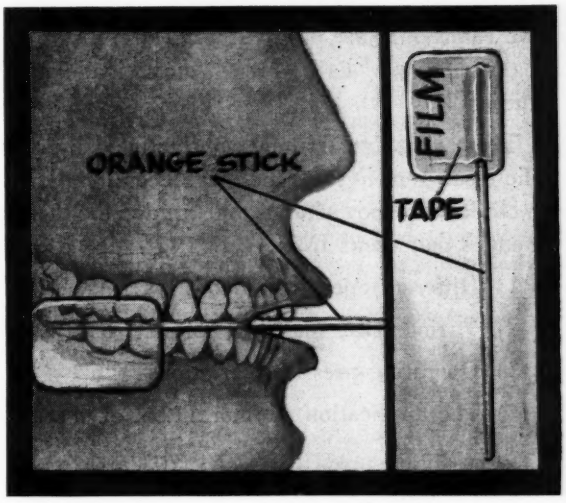
4. Heavy radio earphones are attached to a table model radio in the operating room. The earphones cut out some of the sounds of instrumentation and the radio reception distracts the attention of the patient.

4

A Film Holder for the Lower Third Molar Area

F. E. Morton, D.D.S., Silver City, New Mexico

5. The ordinary film holders cannot be used in the lower third molar area. A convenient holder may be made by attaching a film with tape to an orangewood stick. The film is placed in the lower third molar area and held in position by biting with the anterior teeth on the stick.

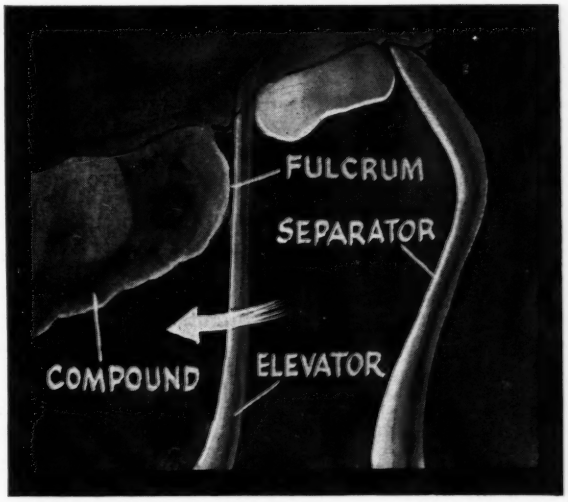


5

Removal of an Isolated Upper Third Molar

Adalberto A. Muller, D.D.S., Panama City, Republic of Panama

6. A partly submerged and isolated upper third molar is often difficult to remove. To secure a fulcrum for leverage, cover the remaining teeth in the quadrant with modeling compound and have it extend distally to proximate the third molar. The modeling compound extension may be used as a fulcrum point when using an elevator.



6

technique involved; and jot down the advantages of the technique. This shouldn't take ten minutes of your time. Turn to page 137 for a convenient form to use.

Send your ideas to: Clinical and Laboratory Suggestions Editor, DENTAL DIGEST, 708 Church Street, Evanston, Illinois.

The EDITOR'S *Page*

THE PREPARATION of the hard tissues of the tooth to receive restorations is the most common surgical procedure that is experienced by man. In a recent report Peyton and Vaughn[1] state: "It has been demonstrated that a temperature of as much as 140 degrees Fahrenheit may occur in the tooth structure within 0.5 millimeters of the cutting instrument when using steel burs of average size, operated at 4000 r.p.m. with a force of 2.5 pounds applied on the cutting tool."

Frictional heat of this magnitude is enough to produce acute pain and possibly delayed degenerative changes in the pulp tissues. These histopathologic reactions have been "most inadequately studied."

These investigators have substantiated by scientific measurement facts that have been long known to clinicians. They set out to determine the thermal changes that occur from:

1) Different operating speeds

2) Various sizes and types of steel burs

3) Operating pressure variations

4) The application of intermittent or sustained pressure

5) Cutting in enamel or dentine or both

6) Different operating time intervals with intermittent pressure applications

7) Various distances from the operating instrument to the thermocouple

8) A comparison of diamond points and steel burs

9) The use of gas-propelled abrasive

It will come as no surprise to clinicians to learn that these procedures are favorable to *less* temperature rise: slow engine speeds, small burs, light and intermittent pressure. We might add to this list: sharp burs.

Although this is a preliminary report and the study is being continued, there are some aspects of the subject that are of immediate and practical interest to dentists. Clinicians are anxious to know more concerning:

1) The comparative merits of ordinary steel burs, carbide-tungsten burs, carborundum stones, and diamond stones in terms of both efficiency and pulp protection.

2) The comparative merits of the dry operative field versus the wet field. The widespread use of air-water sprays has rekindled interest in this subject.

3) The implications in the abolishment of pain sensation under regional anesthesia without control of the temperature rise that occurs during cavity preparation. There is a clinical impression that many postoperative sensitive teeth and necrotizing lesions of the pulp had their origin in the excessive heating of the tooth during preparation under regional anesthesia.

4) The facts associated with the use of gas-propelled abrasives for cavity preparations. In their preliminary report Peyton and Vaughn write: "Within the optimum range of operation the average of the changes in temperature are negligible from the use of this instrument in comparison to the rotary type of cutting tool . . . The average temperature change is only 3.5 degrees Fahrenheit."

With the improvements in the quality of rotary instruments such as diamond stones and carbide-tungsten burs, with the popular use of air-water sprays, and with the airbrasive units soon ready for application we may lose the art of the use of the cutting hand instrument. The older practitioners developed remarkable skill in the use of the chisel, the hatchet, and the other hand instruments. Their sharpening stones were conveniently available and their instruments were made of good steel to take a fine cutting edge. There is certainly no frictional heat from a hand instrument and if it is used sharply and skillfully there is no pain. This art is fast passing, which is regrettable from the aspect of patient comfort and operating finesse.

[1]Peyton F. A., and Vaughn, R. C.: Thermal Changes Developed During the Cutting of Tooth Tissue, Fortnightly Review Chicago D. Soc. **20**:9-23 (Dec.) 1950.

MEDICINE and the Biologic Sciences

Alcoholism — Etiology

For years it was maintained that C_2H_5OH or a weak will was largely responsible for alcoholism. Later many psychiatrists took the equally narrow view that unremitting, excessive drinking was attributable largely to a neurotic pattern of behavior.

There is increasing evidence to suggest that an abnormal psychophysiologic reaction to alcohol on the part of some persons, not shared by most social drinkers, may be at the bottom of the disease-complex of problem drinking. The changes, both in personality and in the biochemistry of the body metabolism of the problem drinker lend considerable weight to this premise.

It is well known that there may be a constitutional predisposition in many cases. Excessive drinking in the family background is found to be four times as frequent as in the case of normal drinkers.

There are three main alcoholic types: (1) the symptomatic type, (2) the true addict, and (3) the secondary addict.

It is generally believed that the symptomatic group accounts for between 40 and 60 per cent of all inebriates. The symptomatic alcoholic is a person whose pathologically and excessive and frequently self-destructive drinking is a symptom of some underlying mental or physical illness, inadequacy, or defect. This is often associated with (1) epilepsy, (2) psychosis, (3) psychoneurosis, (4) mental deficiency, or (5) psychopathic personality.

This subject is a sick person in need of medical care with or without reference to his consumption of alcohol. Until the basic illness is treated depriving him of alcohol is of doubtful value.

Relatively little is known of the true addict. Some clinicians maintain this to be an unusual metabolic reaction, one of the "inborn errors of metabolism." Susceptibility is endogenously determined by the person's metabolic personality at birth, or as it is modified during growth periods.

The secondary addict appears to be a reasonably well-adjusted person psychologically. The drinking patterns in these people are irregular and sporadic and, as their name suggests, are almost always a reaction to precipitating situational factors or reality stress. The end-products, however, are often physical and mental deterioration.

Hirsh, Joseph: Alcoholism and the General Practitioner, Postgrad Med. **8**:5-9 (*July*) 1950.

ACTH in Rheumatic Fever

The pituitary adrenocorticotropic hormone, ACTH, has been found to be of value in the treatment of rheumatic fever. The minimal effective individual dose seems to be between 5 and 10 milligrams. The minimum daily dose is between 20 and 50 milligrams.

ACTH probably acts by causing an increased production of 17-oxysteroids by the adrenal cortex. However, the mechanism by which the adreno-cortical steroids in turn suppress the active rheumatic process is not known.

The rheumatic process subsides in 60 to 80 per cent of the patients following the administration of the hormone. There are some transient withdrawal reactions which subside as time passes.

A tendency of the hormone to cause retention of fluid may result in an aggravation of congestion but suppression of the rheumatic process and consequent improvement in the myocardium tends in the long run to relieve congestion. When retention of fluid occurs, congestive failure can be controlled by a low sodium diet and mercurial diuretics.

Another important reaction is the development of a severe mental depression in an occasional patient. Other minor side reactions are (1) abdominal cramps, (2) headache, (3) the development of roundness of the face, (4) acne and (5) skin striae.

The results noted over a period of months following cessation of treatment have been extremely satisfactory. No doubt ACTH will become a useful agent in the treatment of rheumatic fever.

Massel, B. F.; Warren, J. E.; and Surgis, G. P.: Clinical Response of Rheumatic Fever and Acute Carditis to ACTH, New England J. Med. **242**:692-698 (*May* 4) 1950.

Early Immunization

It has been generally believed that infants under six months of age do not respond well to active immunization. Recent studies show that infants as young as one month respond well to immunization.

Today, active immunization of infants three and four months of age against diphtheria, whooping cough, and tetanus appears to be a sound procedure. The presence of inherited antibodies has some effect in depressing the response to diphtheria toxoid. However, the depressing effect is not

great enough to prevent satisfactory immunization. The satisfactory immunization of infants against diphtheria can be achieved by using highly potent toxoids.

Wide variations exist in the immunizing efficiency of available diphtheria and tetanus toxoids. The potency of these products should be more strictly controlled.

Response to tetanus toxoid is satisfactory. The results of immunization with pertussis vaccine are less certain. However, about 90 per cent of the children do show a response as indicated by the increase of pertussis agglutinins.

Early immunization appears to be an important part of the prophylactic program for all children. It aids in prolonging life as well as preventing and alleviating the particular diseases.

Greenberg, L., and Fleming, D.S.: Effect of Inherited Antibodies on Active Immunization of Infants, J. Pediat. **36**:143-149 (*February*) 1950.

Stuttering

Despite the fact that stuttering has been recognized as a speech disorder for a long time only a few basic facts are known about the disorder. The condition is no respecter of persons as it is found in all types of persons and all stations of life.

About 1 to 2 per cent of the population is afflicted with stuttering. It is more common in boys than in girls, the proportion being approximately 4 to 1. The tendency to persist is more common among boys. The condition always begins in early childhood and oddly enough occurs during those years when the child's articulation as a whole tends to improve and become more distinct.

Stuttering may be defined as the disturbance in the rhythm of speech characterized by intermittent or irregular spasmodic blocking or repetition of sounds and words. Today it is recognized that stuttering, as it develops from its early onset, is an outstanding example of a disorder wherein the emotional factor gradually plays a greater and greater part and, finally assumes a dominant role.

The development of the disorder follows a rather definite pattern: (1) Early symptoms can be detected at about three or four. (2) Most of the children are definitely hampered by the disorder. (3) It has a marked influence on personality.

The adult stutterer usually presents a subdued picture. He is physically and emotionally mature. By trial and error, a pattern of speech with a minimum of stuttering has been evolved and he has learned to live with his difficulty. There are more child stutters than adult stutterers. Some outgrow the difficulty while some do not. Many adults stutter only occasionally, under stress or emotional excitement. Under normal conditions these people speak quite well.

There are no significant biochemical differences between stutterers and nonstutterers. Stutterers have a lower potassium value than normal persons. This may be significant.

There is no definite knowledge of the cause of stuttering. Several theories have valid support but none stand up under critical analysis.

There are no known tests today to determine whether the child who begins to hesitate unduly or to repeat words or sentences will start stuttering or whether the child will have normal speech. The diagnosis of stuttering can be made only when the child stutters as he talks. The rule should be that every child of three to four years who begins to hesitate and repeats words and sentences sufficiently to be noticed should be treated as early as possible.

The basis for treatment of stuttering of the pre-school child is to allow further maturation of the cortical speech areas, so that maximum stability and neuromuscular coordination in the function of speech develop. At the same time it is desirable to hold to a minimum the emotional factors which complicate and accentuate the disorder.

The child's attention should not be drawn to his speech difficulty. In his presence, the parents should talk in a simple, relaxed, and easy manner. They should not try to increase or improve his vocabulary.

A question is frequently posed about the relationship between handedness and stuttering. There appears to be no reason to believe that there is any such relationship. However, every child with a speech disorder should be encouraged to develop his dominant hand be it left or right. The significant factor is the method used in the enforcement of handedness.

The treatment of the older child, the adolescent, and the adult is a much more difficult problem. Individual problems and their adjustments must be treated. It is the therapeutic goal to rid the stutterer of his handicap.

Karlin, Isaac: Stuttering—The Problem Today, J.A.M.A. **143**:732-736 (*June* 24) 1950.

Diet in Tuberculosis

A high percentage of tuberculous patients have a disturbed carbohydrate metabolism as revealed by glucose tolerance tests. Correction of this disturbed metabolism forms the basis of an additional phase in the dietary considerations of tubercular patients.

A low carbohydrate, high protein diet has been used to good advantage in some hospitals. Significant improvement as measured by (1) cough, (2) amount and character of sputum, (3) weight, (4) bodily strength, (5) dyspnea, (6) fatigue, (7) appetite, (8) gastrointestinal symptoms, (9) mental alertness, (10) morale, (11) nervousness, (12) headache, and (13) chest pain has been recorded.

The beneficial effects of the diet are attributed to increased glucose oxygen consumption brought about by elevation of the blood sugar to a normal level in patients with hypoglycemia and by restriction of carbohydrate-rich foods in patients with hyperglycemia.

It is suggested that reduced glucose-oxygen consumption, the fundamental factor responsible for susceptibility

to and persistence of the tuberculous infection, is overcome by the low carbohydrate diet. A normal carbohydrate metabolism is an essential and fundamental mechanism on which defense mechanisms depend.

Sandler, B. P.: Treatment of Tuberculosis with Low Carbohydrate High Protein Diet, Dis. of Chest **17**:398-423 (*April*) 1950.

Uses of Thyroid Substance

Thyroid substance is used widely for classical cases of congenital and acquired hypothyroidism. However, there are several unrecognized manifestations of thyroid disturbances where the use of thyroid substance is of value.

It is not sufficiently stressed that a patient may have a goiter and still have a minus metabolism. The type of goiter which is seen in cretinism in about two-thirds of the cases is a degenerating type and fails to deliver a sufficient amount of thyroid secretion. The metabolic rate may be misleading and every person should be examined for a goiter.

A surprising number of goiters are overlooked because of a superficial neck examination. Too frequently the practitioner depends on the basal metabolism to tell him whether a goiter is present or not. One should treat the patient and not the basal metabolic rate.

Some cases of alopecia are helped by the use of thyroid. This is especially true in the presence of a degenerating type of goiter.

Vertigo or dizziness may be helped by thyroid. Hyperthyroidism may show itself in the vestibular or balancing apparatus. About 85 per cent of cretins have difficulty with hearing. The peripheral hearing apparatus is defective. This may result in vertigo in the adult. In some cases early nerve deafness may be alleviated with thyroid.

Thyroid has been used for chronic headaches in which other causes have not been found. This benefit is paradoxical as one of the first symptoms of thyroid overdosage is headache.

The chronic nasal cold has been helped by the use of thyroid. There seems to be a physiological basis for this. In congenital hypothyroidism there is chronic nasal catarrh and an imperfectly developed nasal epithelium.

Of interest to the dentist is the use of thyroid in individuals who complain of dryness of the mouth. It is not too well known that the thyroid gland is necessary for the development of the salivary glands. Salivation may be induced in sensitive patients, particularly those belonging to the hayfever, asthmatic, and allergic groups.

Probably one of the greatest abuses of thyroid therapy has been in obesity. For many years before thyroid required a prescription, patent medicines containing thyroid for reducing weight were sold by the millions. Reduction may be brought about but the price is the production of medicated hyperthyroidism.

The patient receiving thyroid should be carefully supervised at all times. And those suffering from anxiety or psychoneurosis should not receive thyroid as they are made worse by it.

Moehlig, Robert C.: Lesser Known Uses of Thyroid Substance, J. Michigan M. Soc. **49**:533-538 (*May*) 1950

Musculoskeletal Diseases in the Aged

One of the most common causes of disability in the older age groups is disease of the musculoarticular strucures. Due (1) to the expanding life expectancy, and (2) to the greater number of people now surviing to the later decades, the number of patients with degenerative musculoskeletal diease is increasing.

The importance of the locomoter diseases in the practice of geriatrics is growing steadily. There occurs in the elderly the following combination of symptoms and signs arising in the musculoskeletal system: (1) Pain, (2) progressive generalized muscular weakness, (3) debility, and (4) limitation of locomotion and of articular range of motion sometimes resulting in deformity. This clinical picture is most frequently the result of, or intimately associated with, degenerate changes in the joints.

Musculoarticular inadequacy and failure are noted in the elderly most commonly as an end stage of osteoarthritis. Many theories have been postulated as to the etiology of osteoarthritis. The most commonly accepted concept of causation is the mechanistic theory of "wear and tear."

Minute repeated traumata to the joints as the result of (1) obesity, (2) skeletal disease, (3) localized structural abnormalities, (4) poor body mechanics, or (5) occupational strain may cause wear and tear of supportive tissues and articular structures. In some persons the ordinary stresses of routine functions, by virtue of hereditary or endocrine factors may serve as similar cumulative traumatic or degenerative forces. After a time, these forces produce (1) a loss of elasticity and fibrillation of joint cartilages and (2) subsequent compression and vascularization of the subchrondral bone. Gradual development of (1) synovial changes, (2) osteophytes, (3) bone cyst formation and narrowing of the joint space takes place. The role of metabolic factors, endocrine and biochemical, systemically, or in the local tissues remains to be explored.

In many patients the musculoarticular system is enabled to remain compensated for some time at least, by undergoing pathologic alterations. In others, there is a progressive disturbance of the joint mechanics, further cartilage destruction and osseous changes with resultant articular deformity and the production of a joint which is incapable of performing its functions.

Steinbrocker, Otto; Schwartz, Sheldon; Sverdlets, Samuel; and Bernstein, B. M.: Musculoskeletal Inadequacy and Failure in the Aged, Geriatrics, **5**:121-130 (*May-June*) 1950.

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With Pen in Hand

Successful Full Dentures Through Accurate Centric Occlusion

In the November issue of Dental Digest there appears an article, Successful Full Dentures Through Accurate Centric Occlusion, written by Doctor Meyer M. Silverman.

The article describes an ingenious method of recording vertical dimension in the construction of complete dentures.

The author, however, seems to be laboring under the misconception, or shall I say, confusion, that centric relation, or centric occlusion, as he terms it, and vertical dimension are one and the same thing. Indeed, he seems to treat them as if they were interchangeable terms.

Let me quote the first paragraph of this article which appears under the subhead *Digest:*

"In this method of recording the patient's *normal centric occlusion* for use in transferring an accurate centric occlusion to newly made dentures, indelible or tattoo dots on the gingival tissue are used to record the vertical dimension." (Italics are the writer's.)

The same confusion appears in several other paragraphs which are unnecessary to quote here. But further confusion is added when Doctor Silverman, describing the three-dimension procedures involved in "taking the bite," (1) the mesiodistal, (2) buccolingual, and (3) vertical relationships, states that the first two, that is, the buccolingual and mesiodistal relationships can be "simplified" by using non-anatomic teeth as recommended by Doctor Sears.

May I remind this writer that the mesiodistal as well as the buccolingual relationships of the jaws must be ascertained and established before any type of teeth are set up and tried in the mouth?

Perhaps it would be well here to give a definition of centric relation: It is that relation of the mandible to the maxillae where the condyles are in their most retruded positions in the glenoid fossae and from which all eccentric movements, lateral as well as protrusive, start.

There are several methods of obtaining the correct centric relation of the jaws which would take too long here to describe. I will mention briefly a few:

(1) Having the patient feel with the tip of his tongue the posterior part of the palate while closing the mouth.

(2) Palpating the temporomandibular joint under biting stress.

(3) Obtaining gothic arch registration with mechanical devices. Doctor Sears' trivet is an excellent instrument for this purpose and in our experience has proved very valuable.

(4) More recently, the method of using the natural masticating movements of the mandible has been employed by many with apparent success.

Doctor Silverman conveys the idea that most of the troubles encountered in taking the bite are caused by the operator increasing the vertical dimension beyond normal. This, however, is not the case. Experience has shown that more difficulties are caused by undue closure of the vertical dimension caused by early loss of teeth with consequent tipping and elongation than by unduly opening the vertical dimension.

We are all familiar with these mutilated cases which often cause disfigurement of the facial expression, sometimes giving the appearance of premature senility. Opening the vertical dimension to normal, even if it has to be accomplished in steps, greatly improves the condition and restores facial expression. Let me quote on this subject Doctor Walter H. Wright, Dean of New York University School of Dentistry:

"From the general clinical viewpoint it appears that more troubles of dental origin are being caused by failure to increase the vertical dimension than by too great an

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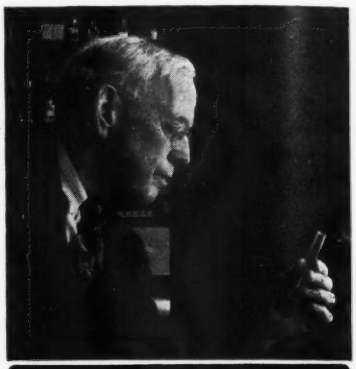

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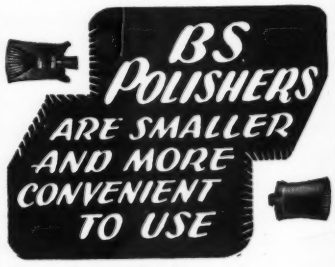

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increase in the vertical dimension of dental reconstructions."

There are various ways of ascertaining the vertical dimension. A great help in this direction is obtained by making facial measurements with a bite gauge such as the one designed by Doctor Willis. The late Doctor Rozsa also devised such an instrument.

Doctor Silverman's method is an ingenious device for *recording* the vertical dimension, *once it has been established.* Beyond that, it does not seem to serve any other purpose.

Emil Agostini, D.D.S.
551 Fifth Avenue
New York 19, N.Y.

Old Articles

I am interested in locating a reprint of an article which appeared in the August, 1946 issue of DENTAL DIGEST: DISHARMONY BETWEEN CENTRIC RELATION AND CENTRIC OCCLUSION AS A FACTOR IN PRODUCING IMPROPER TOOTH WEAR AND TRAUMA by Doctor S. W. Brown. I am a subscriber to DENTAL DIGEST although at that time I was not.

I have also been told that there were two very good articles on occlusion in the May and June, 1934 issues of DENTAL DIGEST. Any help that you can give me will be appreciated very much.

David I. Gold, D.D.S.
76 Standish Road
Stamford, Connecticut

Do you have or know where I can get the July issue of DENTAL DIGEST, 1946?

I was in the hospital this summer and when I came back to work I had to move. During the moving my new secretary threw away this particular issue along with other magazines.

I had been keeping this issue particularly for the article on A SIMPLIFIED FULL DENTURE TECHNIQUE by Doctor Sidney S. Jaffee.

If you do not have this magazine, you might have a reprint. I would gladly pay as much as $5 for this one article.

This request may be wishful wishing. But I thought I would try, anyway. You are my last resort so anything you can do will be greatly appreciated.

Jerrold W. Neel, Jr., D.D.S.
1508-B Havenwood Road
Baltimore 18, Maryland

Muscular Influence on Occlusion as Shown by X-rays of the Condyle

In the article, MUSCULAR INFLUENCE ON OCCLUSION AS SHOWN BY X-RAYS OF THE CONDYLE in the November 1950 issue of DENTAL DIGEST, I believe Leonard Frank has misstated the problem, demolishing a straw man while pointing out a possible method for study.

The question is not whether or not the condyle changes its position by itself. The question is, rather, whether the path of the condyle is determined by the articular surface of the temporal bone and the interposed discs, and further, whether the path of movement of the masticating apparatus is guided by the path of movement of the condyle.

The crucial question to be answered is this: in the function of the normal mandible, do the muscles pull the articular surface of the condyle away from the disc, or is there continuous contact? If there is continuous contact, there is condylar guidance. Only when there is no contact would condylar guidance be absent. The article does not answer this question and I suspect the conventional radiographs will not answer it as the disc is radiolucent.

Frank, in addition, makes several erroneous assertions. He states, " . . . Pressure on the bolus is exerted without the condyle using the fossa as a fulcrum when the condyle is in contact with it." In fact, Frank approvingly quotes Gysi: " . . . an articular joint may be fixed by muscular action at any stage of its possible motion and become just as much a fulcrum for lever action as if it were a rigid anatomic structure . . ."

In this light two other statements are erroneous; namely: " . . . in all probability its [the temporomandibular joint] only function is to act as a floating hinge . . ." and further, "While the condyles are out of the fossae they certainly can have no influence on occlusion."

To summarize, Frank has not shown that the range of "possible motion" of the joint includes loss of contact between the articular surfaces.

Arnold Paulen, D.D.S.
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Contra-Angles

Think Twice and Then Three Times

My friend, George Matthews, editor of the *Bulletin of the Alabama Dental Association*, usually has some capricious incident to report to his readers. One of the latest is the story of his experience in saving 35 cents on some denture abrasive paste and then the loss of the "fee on one set of dentures and the good will of one patient."

All of us have a pet economy or two. One dentist that I know uses his beeswax and modeling compound over and over again until it takes on the pallor of death. He is in the higher income brackets and drives a Cadillac, by the way. I know another that buys the cheapest denture teeth available in job lots. Another dentist of my acquaintance is a ghoul for gold. Any scrap of gold that he can acquire thrills him more than an extra stock dividend. I know several dentists who stir up their own casting alloys and a few who spend precious minutes fabricating their own bitewing films. I could add another to the list who does not own a sterilizer but cooks his instruments in a dishpan. Personally, I am a saver of broken and mutilated instruments and detest to buy impression trays.

Here is the way George Matthews tells his story:

"It has been said by astute business men that more money is made by careful buying than by selling. This is true in dentistry as well as in any other business, but careful buying is *not* buying cheap, inferior merchandise to save a few cents.

"We have heard it said by lots of good dentists, that most dentists *cannot* do good work because they won't spend the money for the materials necessary for the work.

"How silly it is to spend fifteen or twenty dollars' worth of time making an inlay or a crown and then jeopardize the success of the whole thing by trying to save a few cents on the difference in price between a good casting gold and a cheap, questionable alloy . . . or in a denture, where the difference in cost to us between an inferior tooth and the *very best* that the market affords is only a dollar or two, *why* try to save at the risk of our reputation and a satisfied patient?

"We had a valuable lesson once years ago in buying cheap supplies—to save money. We saw no reason for paying fifty cents for a tube of abrasive paste to grind in the occlusion on some dentures, when we could buy some good valve grinding compound at the auto store for fifteen cents. We didn't know that the dental abrasive paste was water-soluble, greaseless, and flavored—we thought those 'wise guys' just bought the automobile valve grinding compound and put their name on it! We used the valve grinding compound and it wouldn't wash off the dentures. We used gasoline to get it off and then the odor and taste of *that* wouldn't come off. Net results: Saving thirty-

five cents. Loss: Fee on one set of dentures and the good-will of one patient.

"Let's remember that *the best materials made are but poor substitutes for what we are trying to replace.*"

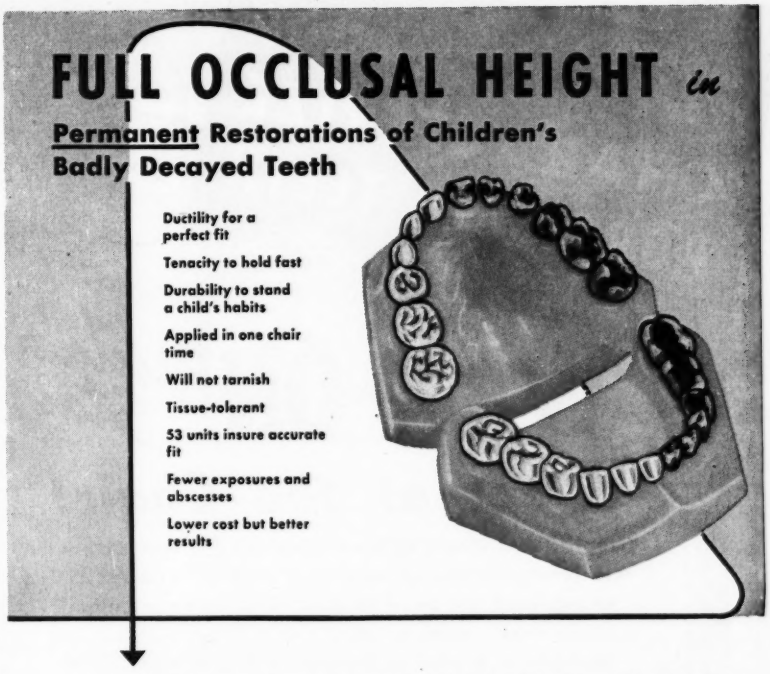
Along with our foolish economy foibles we are likely to have a dash of the hoarder's instinct. For example, I have enough pencils to build a bridge across the Amazon River. A dentist I know has a storeroom of material sufficient to supply a twenty-chair dental clinic.

It is admirable to be an economical and careful buyer and to have an adequate stockpile of supplies but cheap things are often worthless things and excessive stockpiling is a form of miserliness. In an inflationary war economy we may be tempted to buy a thing that is available just because it is cheap. We may also be inclined to put in an excessive supply of materials because of fear of shortages so that we will have worthless shop-worn articles when we get around to using them. We should think twice before hoarding and three times before we buy cheap supplies of materials.

The Bigger They are the Easier to Reach

Recently I had occasion to telephone two men who occupy top executive positions in two of the largest corporations in the country. Neither was in his office at the moment, but efficient secretaries promised that they would return the calls. This they did. The questions that I asked could not be answered without a bit more time. Both of these prominent business men promised to telephone the answers at a definite time. This they did, promptly and with friendly courtesy. In the course of the conversations with the secretaries and with the men themselves there was none of the interrogation and cross examination that I have sometimes experienced in calling a far less important person.

The same principles seem to hold true for correspondence. Write the president of a corporation a letter and you get a prompt reply. Direct your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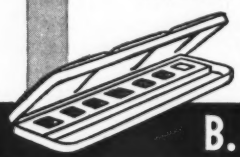

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inquiry to a minor department head and you may never get an answer.

Carried over into the dental scene the same conditions exist. The "big" men in dentistry are anxious to help their colleagues, they are patient with the ignorant, and generous with their time. Some of the pipsqueaks are arrogant, inaccessible, and pompous to the point of nausea.

The explanations for these patterns of behavior lie in the feelings of security or insecurity. People who are well vested with a feeling of psychologic and economic security can "afford" to be magnanimous, tolerant, and thoughtful.

The Romance of Philip Hench

This might sound like a love story or the script of a radio soap opera. It is neither. It is the story of a persistent man who carried and worked on an idea for twenty-five years until it brought forth fruit and the fame that comes with the Nobel prize.

Doctor Hench is on the staff of the Mayo Clinic. He and Doctor Kendall of the Clinic won the 1950 Nobel prize in medicine for their work on ACTH and cortisone. It was on September 21, 1948 that the first clinical application of the adrenal cortical hormone was made on a human being. Let Doctor Hench tell the story in his own restrained but nonetheless dramatic manner:

"On the morning of September 21, before the first injection of cortisone, the patient could hardly get out of bed; once she tried to walk; it was too painful, and so she remained at rest. But on September 23, after two days of use of cortisone, she woke with much less muscular stiffness and soreness, rolled over in bed easily for the first time in weeks, and noted increased strength and appetite. Although she felt much better subjectively and the fibrositic component seemed to be much decreased, articular tenderness was unchanged. On the next day (September 24), improvement continued and we found her exercising, raising her hands over her head, previously impossible. She visited several patients to demonstrate her changed condition. Painful stiffness was gone. 'My muscles feel stronger and my appetite is very good.' After six days of use of cortisone, she had lost almost all her stiffness; articular tenderness and pain on motion were markedly reduced. The next afternoon (September 28) she shopped for three hours downtown, feeling tired thereafter but not sore or stiff. She noted a sense of well-being: 'I have never felt better in my life.' "

Slightly more than two years after the epochal day Hench and Kendall were awarded the Nobel prize. Many people might think that two years was a short and quick trip to fame, but the story goes back twenty-five years to 1925.

Like all great scientists, Doctor Hench has a well-developed power of observation, a quick imagination, and the skill of synthesis. He had noted in 1925 that people suffering from rheumatoid arthritis were often weak, fatigued, and had low blood pressure —conditions frequently encountered

in disturbances of the adrenal mechanism.

Four years later, in 1929, he made two other observations: that people with jaundice had an improvement in their rheumatoid arthritis and arthritic women in pregnancy had marked remission of their symptoms. He reasoned that the unknown substance was probably some biologic agent present in normal healthy persons but lacking or deficient in patients with rheumatoid arthritis. Jaundice and pregnancy somehow stimulated the production of the antirheumatic "X substance" and as a consequence the pain, soreness, and stiffness of rheumatism were relieved. The problem was to identify the "X substance."

This takes the story to 1938. By now Hench was certain that whatever "X" was, it was bisexual because both jaundiced rheumatoid men and pregnant rheumatoid women were relieved. Furthermore, the jaundiced and the pregnant experienced relief from such other nonrheumatic conditions as hay fever, asthma, migraine headaches, and psoriasis. He was on the trail of something that was not specifically for arthritis but for a whole galaxy of other clinical conditions.

In 1941 Hench carried his problem to his colleague at Mayo Clinic, the biochemist, Kendall. For seven years they persisted with exhausting determination. Then the fateful day of September 21, 1948 came, after twenty-three years and countless hours of work and study. Once again the copybook maxims of industry, faith, persistence had been proved and the world was made better.—E. J. R.

Aureomycin and Bacteremia in Tooth Extraction

ROTH[1] AND his co-workers show that dental manipulation for removal of a focus of infection in persons with damaged heart valves or congenital

[1]Roth, O.; Cavallaro, A. L.; Parrott, R. H.; and Celantano, R.: Aureomycin in Prevention of Bacteremia Following Tooth Extraction, A.M.A. Arch. Int. Med. **86**:498 (Oct.) 1950.

CLINICAL AND LABORATORY SUGGESTIONS

(*See pages* 126 *and* 127)

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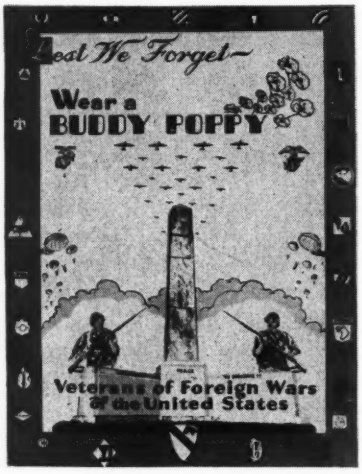


heart disease may cause bacteremia and precipitate subacute bacterial endocarditis.

Previous Agents Unsuccessful

Sulfadiazine and sulfapyridine were employed prior to and following dental operations to prevent bacteremia, but these drugs were not always effective. Penicillin in oil has also been used. It reduces the occurence of bacteremia substantially, but it occasionally causes allergic reactions.

Presence of Dental Infection

Aureomycin was used by the authors in patients who underwent tooth extraction. As the successful action of aureomycin in preventing bacteremia was yet unknown, patients with heart murmurs or patients with a history of rheumatic fever, chorea or any previously diagnosed congenital heart disease were excluded.

The Use of Controls

1. Every other patient received aureomycin; the alternate patients served as controls.

2. A total of 2 grams of aureomycin divided in four doses was given on the day before extraction, on the same day, and on the day after.

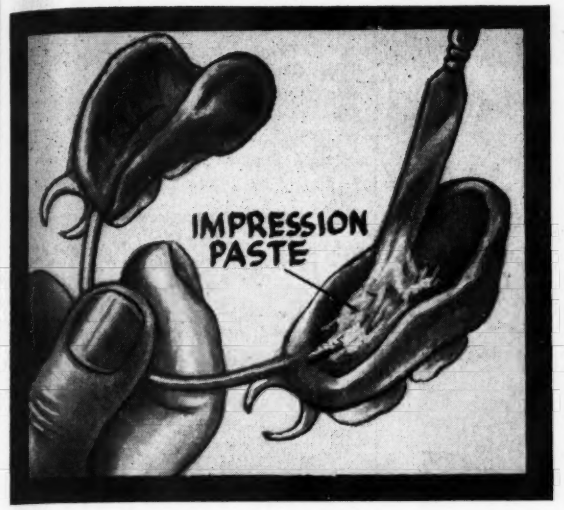
3. Of 25 patients who had not received any biotic, 14 had blood cultures positive for Streptococcus viridans immediately following tooth extraction.

4. Among 25 patients who had received aureomycin, only one blood culture positive for Str. viridans was found.

Preliminary Examination Important

When it is realized that about 20 percent of all cases of subacute bacterial endocarditis can be traced to recent dental manipulation the results of the study become important.

Before such an operation every patient should be questioned and examined for valvular or congenital heart disease, and, if such a condi-



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Doctor Henry Walden's keen mind and clever hands have made valuable contributions, not only to dentistry, but to aviation, medicine, clinical and three-dimensional photography, automotive design, and the development of guided missles! The story of his many interests and accomplishments is told by Doctor Herbert Paskow. We hope that someday the material in this article will be expanded to a book-length "life" of the man whose inventive genius and engineering skill have won recognition in so many fields.

★ ★ ★

"Who Cleans Soldiers' Teeth?" asks Doctor Howard M. Taylor. Don't answer, offhand, "the dentist, of course," because that's apparently not the correct answer in the Army. Doctor Taylor says there are instances of enlisted personnel and civilian employees—who are neither hygienists nor dentists—being permitted to work on the teeth of the soldier. Substandard dentistry in the Army is a subject that should be of vital concern to every member of the dental profession.

★ ★ ★

What happens when the dentist must break appointments? . . . Charles P. Fitz Patrick tells us of the experience of one of his friends who turned an ankle on the way to the office and had a difficult time locating his patients in order to cancel their appointments. He suggests being prepared for similar emergencies.

★ ★ ★

What qualifications distinguish the genuine specialist from the fraudulent? . . . Doctor David Tabak lists three types of dentists who specialize and comments on each group. You will enjoy his penetrating analysis of real and "imitation" specialists.

★ ★ ★

Have you ever tried defining "dental health"? Doctor George A. Swendiman admits it's a difficult term for layman, physician, or even dentist, to pin down. His explanation of the inter-relationship of systemic and dental health, and of the importance of diet to both, makes an extremely interesting article.

★ ★ ★

Have you ever found that roentgenograms you need for comparison or study have turned brown-spotted or faded? . . . Then read Sylvia Danenbaum's discussion of the correct processing of the film. The information may save you disappointment in the future.

★ ★ ★

All of these articles—together with the regular monthly departments and features—you'll find in the March issue of Oral Hygiene.

tion is found, should be given prophylactic treatment.

The Drug of Choice

Aureomycin is at present the drug of choice (1) *because it reduces the incidence of Str. viridans bacteremia,* (2) *can be given orally,* (3) *apparently does not produce drug-resistant organisms, and* (4) *it has a relatively low toxicity.*

From Current Medical Literature, *Journal of the American Medical Association* **144**:1588 (Dec. 30) 1950.

Latest Thoughts in Medicine

Brian Blades: Lung cancer is increasing. The only chance of cure is surgery.

Stewart Wolf: Anger, resentment anxiety, emotional upheavals may eventually lead to tissue change and true disease in the stomach and intestines.

Arlie R. Barnes: ACTH and cortisone are helpful in the control of rheumatic fever. These hormones do not seem to cure the disease or shorten the usual duration; the acute manifestations are suppressed. Common complications following treatment are moon-shaped face, acne, the occurrence of white and purple markings on the body, temporary cessation of menstruation. ACTH is also effective in the treatment of burns.

Harold J. Friedman: Warned of the dangers of overtreatment with antihistamines. Toxic effects may involve the nervous system with disorientation, confusion, delirium, hysteria, neuritis.

Edward A. Marshall: Sudden and acute pain in the abdomen may be due to conditions other than appendicitis—stone obstruction, ulceration, interference with blood supply. In cases of abdominal pain give nothing at first, enema second, food very late, laxative never.

Arthur J. Horesh: Allergy in children includes more than hay fever, asthma, eczema, and hives. The allergic infant has nursing difficulties, colic diarrhea, and vomits easily. Formulas that agree with him are difficult to find.

Eczema may develop from the foods to which he is allergic and colds and bronchitis are common. Allergic children often present behavior problems.

Rudolph S. Reich: Fracture of the hip treated by metal nails is successful in 85 per cent of cases. Particularly helpful to the elderly.

Keith S. Grimson: Remarkable results achieved from treatment of peptic ulcer with new drug, Banthine.

Benjamin P. Persky: Warned of the dangers associated with the development of freckle-like pigmentation of the skin that occurs late in life. This may be a malignant mole.

Adapted from *Science*, January 5, 1951, from an article by Austin Smith, Editor of the *Journal of the American Medical Association.*

Dental Meeting Dates

Arkansas State Dental Association, regular meeting, LaFayette Hotel, Little Rock, April 1-4.

Oklahoma State Dental Association, regular meeting, Oklahoma City, April 15-18.

Alabama State Dental Association, regular meeting, Birmingham, April 16-18.

California State Dental Association, regular meeting, San Francisco, April 16-18.

American Association of Industrial Dentists, a component member of the Industrial Health Conference, annual meeting, Atlantic City, New Jersey, April 24-26.

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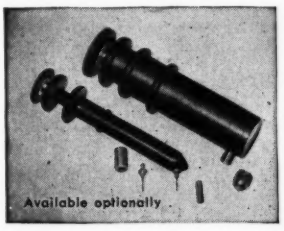

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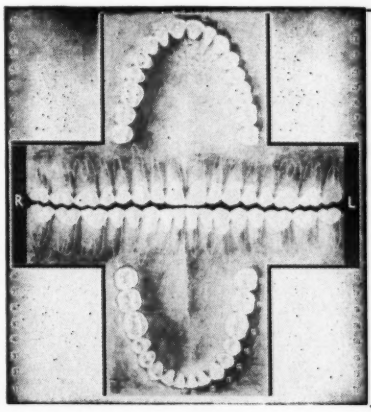

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